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APPROPRIATE HEALTH TECHNOLOGY TRANSFER TO THIRD WORLD COUNTRIES: A COMMUNITY DEVELOPMENT PERSPECTIVE

by

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A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
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ABSTRACT

To meet the basic health needs of people in developing countries, the primary health care approach is considered essential to achieve an equitable distribution of health resources. An integral component of primary health care is the development, adaptation and application of appropriate health technology. The aim of this study is to critically analyze the literature on appropriate health technology, and to develop a community development model for appropriate health technology transfer.

The discussion on health care in developing countries outlines the magnitude of health problems existing in those countries. Health care systems in developing countries have grown out of colonial tradition, foreign assistance, political gestures and promises, and consequently imitate western models of medical practice and technology. These health systems draw on the limited health resources, but fail to provide universal coverage of the population. The need for redesign of health delivery systems and development of more appropriate health technologies within a primary health care framework is thus apparent.

The conceptual and theoretical framework for appropriate health technology transfer is developed through an analysis of the concepts of technology, appropriate technology, technology transfer and by a review of the problem of transfer of inappropriate health technologies.

The study has explored the role of community development in appropriate health technology transfer by examining the concept and models of community development; models applicable to technology transfer within a community development framework; and the concept of the primary health care model.

The primary health care model has been compared with current models of community development. This thesis indicates that the primary health care model and community development models are similar in their goals; that is to encourage the growth of local autonomy, community organization and participation in health and social development.

The study has identified certain shortcomings in the primary health care experiences of developing countries. These include lack of a national commitment, entrenchment of political and economic elites, a fragmented approach to health services, urban/rural disparity in health delivery, and obstacles to community action and participation. The thesis indicates these problems need to be remedied to ensure successful transfer of appropriate health technology.

The study concludes by proposing a community development model for appropriate health technology transfer. The model contains six sequential stages namely, identification of health needs, selection of health technology, introduction of technology, transfer process, implementation, and evaluation. Within the main stages of the model a number of specific strategies have been described as a means of arriving at problem formulation, technology selection and transfer. An assumption of the model is that it will take place within a primary health care framework, which will provide the intersectoral coordination in the health care system to implement the strategies outlined.

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CHAPTER I

INTRODUCTION: THE PROBLEM UNDER STUDY

The strategy of providing health care services and technology in developing countries has tended in the past to be modelled on that of industrialized countries. Many developing countries historically have been former colonies. Medical practices and technologies introduced by the colonial power were based on health problems of industrialized nations, and as a consequence were inappropriate to the setting and the people of the developing country. Services were centralized in urban areas covering only a privileged part of the population, and remaining inaccessible to the rural population.[1]

With decolonization, the new governments gave priority to socioeconomic development and health services played a secondary role. The medical services which remained in place perpetuated Western style medical practice and technology. Maldistribution of health personnel between urban and rural areas resulted in the large rural segment of the population being ill-served or not served at all. It is apparent that shortages of health personnel, limited economic resources and maldistribution have been identified as factors inhibiting the total outreach of medical care to rural areas in developing countries.[2] Poats has drawn attention to this situation:

> In short, financial reality demands that developing countries find ways of making health services much more efficient than in the past. They cannot afford to copy the West's very costly and inefficient methods of distributing health care.[3]

In the case of health technology transfer, a technology which provides effectiveness and safety under controlled conditions may be quite ineffective if the country cannot afford it, if it is not acceptable to the population served, or compatible with local conditions.[4] As Djukanovic and Mach observed:

> Much of modern health technology, however, is inappropriate or irrelevant to the immediate needs of people in developing countries. Moreover, owing to the high cost of sophisticated equipment and other requirements, it tends to absorb, for the benefit of a minority of the population, a substantial share of limited resources that could be used to benefit all the people.[5]

In terms of choice in developing countries, preference for foreign technology as opposed to domestic technology has been noted. Foreign technology is viewed as being more reliable, efficient and often comes with a package of management services and information necessary for the developing country user. The ability of the foreign supplier to provide prompt maintenance and repair service including replacement components can significantly affect the technological choice. Disadvantages of foreign technology cited include dependency on the foreign source of supply, injudicious introduction of technology affecting the country's natural resource base and environment, and provision of obsolete units and systems.[6]

There is no doubt that industrialized countries possess a reservoir of valid knowledge, know-how and experience which developing countries need to acquire and apply. However, it is equally certain that not everything is suitable for transfer to developing countries, and that a high degree of selectivity is required in order to make the correct choices. The process of choosing an appropriate technology is a blend of technical and social details. It is both a technology which combines existing local knowledge and resources with new information and a style of technical, social and economic development where there is close interaction between the users and consultants.[7]

Experience has also shown that even the appropriateness of a given technology is not a sufficient condition for its widespread adoption. The receiving society's attitudes and values play a critical role in its acceptance. Technology must be viewed within the cultural context in which it is introduced. As Lawand et al have observed,

> Technology determines what is possible, but values and attitudes determine what is socially acceptable. The criterion of social acceptability either limits or enhances the probability of adoption of a given technology.[8]

Furthermore for health technology transfer to be successful, it also requires active participation of the community in the definition of their major health needs, and in the development, testing and improvement of technology which is offered to them.

The transfer of inappropriate medical technologies to developing countries has been identified as one of the foremost problems in international health.[9] It is of paramount importance that more appropriate health technologies be developed, and more effective measures for their transfer be explored in order that health resources are fully utilized to cover basic health needs in developing countries.

The purpose of the study is 1) to critically analyze the available literature on appropriate health technology transfer to Third World countries: 2) to develop a community development model for implementation in appropriate health technology transfer to Third World countries. This encompasses a review of the field of appropriate health technology transfer in terms of what has been done to date to arrive at conclusions within a community development framework.

This study has relied heavily on library research conducted at the University of Alberta. Documentary and textual material produced by authorities in the field and international agencies have been examined for basic data.

Journals and magazines available in the University of Alberta Libraries have been important sources of data.

The examination of the problems of health technology transfer to developing countries may stimulate critical reflection and assist the role of governments and international agencies in determining the appropriateness of Western technology for transfer, relative to each country's needs.

This study may become useful by providing the type of community development model necessary to facilitate the transfer and adaptation of health technology to developing countries.

Recommendations for product and technology modification based on community development approaches could be utilized by manufacturers of commodities. The ultimate goal of health technology transfer through a community development framework would be the production of the technology by the people themselves in developing countries, thus epitomizing the process of self reliance.

It has been a rewarding opportunity for the author to be able to present her thoughts and ideas on the role of community development in the process of appropriate health technology transfer to developing countries.

This study is limited in its scope because most of the data has been of a secondary nature. Interviews and systematic observation of the current transfer of health technology in developing countries would provide a clearer picture of the problems encountered on site. However, due to lack of time and work commitments, it has not been possible for the author to obtain such firsthand information. The author's familiarity with the health care and community development fields has facilitated the process of interpreting the literature, as well as providing a critical analysis leading to formulation of a community development model for health technology transfer. However, in this situation the author's own bias is inevitable.

Thesis Outline

Chapter II presents a profile of health care in developing countries and the problem of transfer of inappropriate medical technologies; a determination of health care priorities, and strategies geared towards a more appropriate health technology.

Chapter III examines the concepts of technology, appropriate technology, and technology transfer in the development of a conceptual and theoretical framework for appropriate health technology transfer.

Chapter IV discusses the evolution of the concept of community development and current models of community development; models applicable to technology transfer within a community development framework; and a review of the concept of the primary health care model.

Chapter V presents a community development model for appropriate health technology transfer which has been developed by the author.

Chapter VI, the conclusion, is a review of the key points of the thesis leading to development of a community development model for appropriate health technology transfer to Third World countries.

Footnotes

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9 M. Bader, "The International Transfer of Medical Technology - An Analysis and a Proposal for Effective Monitoring", International Journal of Health Services, VII, No 3 (1977), 443.

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CHAPTER II

HEALTH CARE IN DEVELOPING COUNTRIES

As defined in the constitution of the World Health Organization, "health is a state of complete physical, mental and social well being and not merely the absence of disease and infirmity".[1] This broad definition indicates a physical, mental, social and cultural harmony or adjustment with the environment by the individual.

Despite efforts from governments and international organizations, the basic health needs of much of the world's population have not been met. The majority of developing countries lack the basic resources to allow people to grow and develop: eg: food of sufficient quality and quantity, a safe water supply, sanitation, adequate housing and shelter, education and health care. Health problems in these countries are many, and often of endemic and epidemic proportions.

In the past, health services adopted by developing countries have been modelled from approaches used in industrialized countries. Health services have been urban based, utilizing sophisticated equipment and highly qualified personnel and only cover the privileged, remaining inaccessible to the under privileged rural population.[2] These approaches to health care delivery have been unsuccessful in providing universal coverage.

A Profile of Developing Countries

Geography: Countries in the developing world are predominately located in the tropics, in Africa, Asia and Latin America between the tropics of Cancer and Capricorn. Although some industrialization occurs, the population is primarily occupied in subsistence agriculture.[3]

Demography: A pattern of illiteracy, ignorance and poverty is evident in most developing countries. The bulk of the population live in rural areas maintaining traditional village societal patterns. Urbanization trends of the affluent countries are becoming evident in developing countries with the growth of squatter settlements within and around urban centers. The rate of population growth is high, running up to 3.5% per year. Populations are composed of the younger age groups. 50% of the population is less than 15 years of age, and 20% less than 5 years of age.

Demographic statistics reveal high birth rates with high infant mortality rates, high maternal mortality rates and high accrued death rates. Particularly significant is the high mortality rate in children under 5 years of age (up to 350 per 1000 live births).[4] However, life expectancy in developing countries has been noted to be steadily increasing. Prior to the Second World War, life expectancy at birth was about 32 years: by 1960 it had reached 44 years, and by 1970 49 years. More recent estimates in 1978 show that life expectancy in the Third World had reached 55 years.[5]

Environment characteristics: As noted in the joint WHO/UNICEF study:

> Among the other obstacles to development, many countries have to contend with an unfavorable physical environment - poor soil, difficult terrain, lack of forest and mineral resources - and an adverse climate with periodic excessive rainfall, extremes of temperature, and droughts. These physical obstacles may be compounded by the insufficient or inappropriate application of modern science and technology and unfavorable terms of trade. [6]

Under-nutrition, malnutrition, infectious and vector borne disease form a vicious cycle in many developing countries. Environmental hazards include contaminated water supplies, inadequate waste disposal, poor housing and shelter and inadequate food supplies. Food production is seasonal and dependent on vagaries of weather. Much wastage occurs through rodents and inadequate methods of storage and preservation. Additionally, low incomes force reliance on cheap and nutritionally inadequate food lacking in protein.[7]

Economic characteristics: Economic indicators include a low per capita gross national product (GNP) and low per capita health expenditures. GNP figures for developing countries can be misleading, as many live outside the cash economy. The rural population, particularly subsistence farmers, grow their own crops and conduct many of their transactions by barter. Despite these factors and shifting exchange rates, the GNP can be a useful indicator.[8] Data from various countries show a strong correlation between economic level (GNP) and health (mortality rate). High rates of mortality at all ages, but particularly infant mortality, are correlated with low levels per capita GNP.[9]

Nutritional status is dependent on socioeconomic factors such as percent of income spent on food, availability of food and family size. Nutritional status thus influences economic development. In a predominately agricultural economy, the quality of labor assumes a critical role. In developing countries, malnutrition and infectious disease resulting in a poor state of health of the population has adverse implications on labor productivity and availability.[10] Health needs compete for scarce economic resources in developing countries and often receive a low priority rating.[11]

Cultural determinants: Sociocultural factors play a significant role in health and disease and in provision of health care in developing countries. Attempts to achieve progress are hampered by the heterogenous nature of society comprised of disparate groups of differing ethnic, religious and cultural origins. Prevailing beliefs and customs have adverse effects on diet and environmental hygiene practices and family planning. Disease is often viewed as punishment for impiety or breach of taboos. Illiteracy, ignorance, and feudalism perpetuate traditional practices and so resist the introduction of change. Beliefs in witchcraft, black magic and mysticism serve to maintain the innate conservatism. Traditional medicine is still practiced and assumes great importance in the cultural fabric of developing countries.[12] The introduction of major environmental engineering projects, eg: dams, in many developing countries has resulted in large scale disruption and resettlement of the population. Large scale irrigation projects have brought attendant health problems by the breakdown of cultural patterns and the spread of water borne disease.[13]

Political characteristics: Most developing countries have been colonies. In the early colonial days, medical care was covered by doctors of the colonial power. In time, medical care was supplied by nationals trained in medical schools of the colonizing nation. Some medical schools were established in the colonies, but the curriculum and faculty were from the colonizing nation. Post graduate training by nationals was undertaken in medical institutions overseas. As a result medical graduates became familiar with health problems of industrialized nations, but not of the health needs of their own populations. Lack of decision making by the local rural communities resulted in establishment of western style medical practice in the urban areas. With decolonization, the new governments gave priority to socioeconomic development and health services played a secondary role. Furthermore, exodus of senior administrative expatriate personnel left serious gaps in the health infrastructure for decision making and training.[14]

Medical graduates in developing countries still acquire the medical mores and attitudes associated with affluent countries. Bader has observed:

> Cultural diffusion of international medical values takes place in medical schools of developed countries where Third World students are sent to train. While the emphasis in these schools is almost uniformly on curative rather than preventive medical care and on acquiring the expertise to use sophisticated medical technology in the diagnosis and treatment of disease, these values are usually inappropriate to the needs of the developing world.[15]

Preventive medicine and the challenge of treating endemic disease in rural populations are not as attractive nor as lucrative for professional health personnel trained in an urban environment.[16] Maldistribution of health personnel between urban and rural areas, results in the rural population being ill served or not served at all. High training costs make the attainment of an adequate physician/ population ratio impossible in all developing countries.[17] Moreover, the medical "brain drain" to industrialized countries reflects the general problem of providing medical education and health manpower which is appropriate for the conditions of developing countries.[18] As Bader has noted:

> The exodus of human health resources implies a very serious decapitalization for each donor country. One estimate quantifies the annual flow of physicians to the United States at $200 million, a sum which is equivalent to the total medical aid given by the United States to Latin America throughout the decade of the 1960's. Thus, as with other forms of foreign aid, medical care constitutes a net flow of resources to the developed world.[19]

As a source of national pride, the political leadership in some developing countries influenced by medical elites, have been known to invest the limited health budget in irrelevant high technology in modern hospitals in urban areas.[20] The cost of transporting and assembling technical equipment and building materials greatly exceeds that of a comparable hospital in the developed world. The maintenance of electronic equipment and recurrent costs in the operation of such facilities create additional and often insurmountable problems.[21] Illich has written:

> Modern hospital beds, incubators, laboratories, respirators and operating rooms cost even more in Africa than their counterparts in Germany or France where they are manufactured: they break down more easily in the tropics, are difficult to service, and are more often than not out of use. As to cost, the same is true of the physicians who are made to measure for these gadgets.[22]

Furthermore, the disparity in resource allocation between urban and rural areas further exacerbates the problem of achieving total health coverage.

Determination of Health Care Priorities

Shortages of health personnel, limited allocation of economic resources and their maldistribution have been identified as factors inhibiting health care to rural areas in developing countries. Although services are designed for total coverage of the population, there is heavy concentration of material resources and trained human resources in the urban areas.[23] The many and varied costs in providing logistical support to health services to rural and scattered populations have been noted. Costs include those of building roads linking small numbers of people, of transporting items over long distances, of transportation and of radio relay for long distance telephones. Similarly, the installation of sewage and water systems raises the unit cost well above that of urban communities. Additionally, widely scattered populations cannot act as effectively to exert political pressure.[24]

To accomplish coverage of the entire population, health services should meet certain general criteria which would be similar regardless of country or region. As noted by Parker:

> Basic health services should 1) provide care for the major important health and disease problems which people face (comprehensive in this sense); 2) be acceptable to those served ie meet consumer "wants" as well as being socially and culturally compatible; 3) be available at the community level on an ongoing basis; 4) be as effective as the stage of scientific knowlege and financial and manpower resources will allow; 5) be as safe as possible; and 6) contribute whenever possible to overall personal and community development.[25]

It is apparent to extend health care coverage to meet these criteria to people in developing countries, the health care approach as used in western industralized countries is inappropriate. Of great concern in developing countries is the imbalance between the health needs of the people and the capacity of health care resources to meet these needs. Furthermore, the health system as a specialized subsystem in a society competes with other functionally relevant systems for an adequate distribution of resources. Field has commented on this issue:

> As a differentiated subsystem of society, the health system is neither self supporting nor autonomous, but must, in the nature of the case, rely on the availability of supports and resources from its parent society. Such structural supports cannot be taken for granted and must remain problematic, particularly as resources are usually finite, and there is constant competition from other subsystems for such supports. The elimination of such supports, or their substantial diminution would immediately have a significant impact on the ability of the health system to function, and would eventually deprive the social system of it's health services or a significant portion thereof.[26]

In order to provide the balance between needs and resources it is necessary to use the limited health resources wisely, and to mobilize previously untapped community resources.

In an endeavor to accomplish this task in developing countries, three major strategies have emerged - the development of primary health care systems, community development programs and programs geared towards developing a more appropriate health care technology.[27]

The World Health Organization has given its support to the development of primary health care systems with the goal of providing basic health services to people in the developing world by the year 2000.[28] A joint WHO-UNICEF study proposed that an adequate approach to meeting basic health care needs must include:

> Sufficient immunization; assistance to mothers during pregnancy and at delivery, post natal and child care, and appropriate advice in countries that accept a family planning policy; adequate safe and accessible water supplies, sanitation, and vector control; health and nutritional education; and diagnosis and treatment for simple disease, first aid and emergency treatment and facilities for referral.[29]

The primary health care concept has been proposed as a means to achieve a more equitable distribution of health care resources in developing countries. Primary health care provides simple, effective, readily accessible services, and forms the entry point to the health system for the majority of the population.[30] The term "primary" implies the presence of other levels in the health care system, namely secondary and tertiary care. Primary health care begins at the local community level, where health personnel initiate basic preventive care, curative care and rehabilitation services. The preventive care aspects of the program include family planning, health education and immunization. Staff at this delivery point may be auxiliary health workers, nurse practictioners or physicians depending on the level of education and affluence in the particular country. The usual approach in Third World countries is to select and train members of the local community to become primary health workers. This procedure helps to ensure the return of candidates after training to their place of origin, and also provides health personnel who are familiar with the local culture and are acceptable to the community.

The secondary level offers additional preventive, curative and rehabilitation services. Health personnel at this level provide more specialized skills and care to people referred to them by health workers at the community level. Furthermore, health personnel at the secondary level complement and supervise the field activities of primary health workers.

The tertiary level of care is provided by professionals, both generalists and specialists, who treat the more complex health problems that cannot be solved at the primary or secondary levels. Each level of the health delivery system should function in concert with the other levels.[31]

The cornerstone to delivery of primary health care is the primary health worker. Most preventive measures and many medical procedures are simple. They do not require extensive professional training. Primary health workers can be recruited at the village level, trained near the village, and so can be said to belong to the people.[32] Primary health workers are non professionals trained in a problem oriented manner. Their training period varies from a few weeks to months depending on their health care roles - these roles vary from region to region and nation to nation.

Comprehensive medical care is broken down into functional modules and performed by a number of primary health workers. The auxiliary health worker often has a small clinic or health post available to them with a limited supply of drugs and equipment and trained to perform basic health and laboratory work.[33] A key feature of a primary health care system is its linkage to the indigenous system already in place. Indigenous healers are respected members of their communities, and by upgrading their skills with new knowledge, a reservoir of health care personnel can be brought into the health system. Similarly, midwives, well accepted by their communities, can augment their skills with further health care education and be utilized effectively in the health care system. As a consequence, aspects of the old practices are incorporated into the new system in a socially acceptable way. Furthermore, it is necessary to take into account local beliefs and practices in the formulation of development plans to ensure acceptance. Paramount to successful primary health care is grass roots participation at the community level in health activities as a component of integrated rural development.[34]

It is apparent that community development programs have a significant linkage to health and health care activities. Programs which improve road, transportation and communication systems enhance the economy and can improve health status. Similarly, improved agricultural practices provide economic and nutritional benefits to the community. A healthier population in turn can contribute greater energy to work and community activities. Community development with its emphasis on community participation in planning, development and management programs plays a significant role in improving standards of living. Moreover, direct involvement of community development programs in the community's health care system, such as primary health care, is of vital importance if health services are to be understood and compatible with community needs. In any health strategy, the community's opinions and attitudes must be known and taken into account if the approach is to be successful and accepted.[35]

Another strategy to alter the balance between resources and health needs is to ensure that the health technology employed is appropriate. The concept of an appropriate technology for health care considers that all countries are limited in how much care they can provide. This fact is also becoming increasingly recognized in highly industrialized countries. This does not mean new scientific and technological advances do not have relevance to developing countries, but it does mean the immediate benefits are limited. An exception to this view would be the creation of new technologies or revamping of older technologies in keeping with the resources and needs of developing countries.[36]

Successful primary health care requires the development of an appropriate technology concentrating on poor health conditions amendable to modification or eradication, and on health interventions that can be applied by front-line personnel at the community level. For health technology to be appropriate, it must achieve balance between effectiveness, cost, complexity, and feasibility.[37] In developing or adapting a health technology to developing countries, it is therefore essential to take into account not only the technology itself but the cultural, educational and political implications. It is apparent systematic problem solving needs to be undertaken by each country to select the precise health technology to meet local needs. This requires interaction at all levels of the health infrastructure, but centered at the community level in the problem solving process. As Parker noted it is important:

> ... to ensure that each action taken, each technology used realizes it's potential for effectiveness to the fullest degree possible, at the same time as it is made affordable, usable under the circumstances of delivery, and acceptable to the people served.[38]

It is clear that if health care technology could meet these criteria, wider coverage of the health needs of the population in terms of basic health care could be attained.

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CHAPTER III

APPROPRIATE HEALTH TECHNOLOGY TRANSFER - CONCEPTUAL AND THEORETICAL FRAMEWORK

The Concept of Technology

The role of appropriate health care technology has been recognized as an integral component in the promotion of primary health care and rural development programs in developing countries.[1]

The terms "technology" and "appropriate technology" sound deceptively simple, but they contain complex and interdependent changes.

There are a plethora of definitions of technology. The majority of definitions include social aspects and refer to a body of knowledge, information and skills. Technology, in the broadest sense, has been described as the means by which man undertakes to change or influence his environment.[2] This description incorporates the creative and adaptive capabilities of man. Technology, in this sense, is similar to the meaning of the French word "technique" which Ellul described as not meaning machines, but rather the totality of methods rationally arrived at and having efficiency in every field of human activity. This interpretation goes beyond the engineering aspect to include forms of organization, methods of analysis and the structure of systems for attaining set objectives.

Poats[4] has also defined technology from the broad perspective, as knowledge systematically applied to practical tasks. This knowledge is acquired out of analysis and discovery through research in the natural and social sciences. Technology, to be applied to serve human needs, is given form and expression through invention and innovation in objects, processes or techniques.

Goulet noted the variety of technologies in his definition of technology:

> In its broadest sense, technology may be defined as the systematic application of collective human rationality with a view to achieving greater control over nature and over human processes of all kinds.[5]

In considering technology in the context of development, Goulet distinguished between product-embodied, process-embodied, and person-embodied technology. In product-embodied technology, the know-how is embedded in a precise object. Process-embodied technology refers to the know-how within a sequential process. Person-embodied technology concerns the know-how existing within a person such as a consultant.[6]

Goulet has also commented on the distinction between hard and soft technology:

> Hard technology refers to forms which are expensive, capital intensive, complex, not readily adaptable to materials other than highly precise standardized ones. In contrast, a technology is called soft when it is relatively inexpensive and labor intensive, flexible and adaptable to local materials of non standard quality, and which can be installed, repaired and maintained by people of modest technological training.[7]

As Goulet observed, it is important not to confuse hard and soft technology with hardware and software which are terms used primarily in computer technology.

Hannay and McGinn[8] in a characterization approach to technology, found it useful to distinguish between the form and content of technology. In regard to the form of technology, it could be considered a distinctive form of human cultural activity, similar to religion, medicine or philosophy, and composed of components included resources, processes, outputs and functions within a sociocultural environmental context. The significant aspect of technology viewed as a form of human cultural activity is in the nature of its output and its general function or purpose. As noted by Hannay and McGinn:

> The ultimate output of technology consists of material products, and procedural systems for the production, management, and use of material artifacts, and for the control and enhancement of other forms of human activity created with a view towards expanding the realm of practical human possibility.[9]

The content of technology would include the complex of knowledge and methods and other resources used in creating a certain kind of product or procedural system at a given time in a particular society.

Dispersal of technology has occurred at various periods throughout history. The early Chinese development of printing, gunpowder and the magnet significantly changed the scope of activities and the view of the world. Since the third century, the focus of technological development has been in the areas of communication, military power and mobility through travel.

Prior to the Industrial Revolution, which occurred in Europe two centuries ago, another evolutionary period emerged. This stage included the development of merchant, craftsman, guilds and worker groups in European cities, and the establishment of market economies arising from commerce and productivity. During this period there was a flowering of scientific knowledge, from astronomy to physics, which provided the foundation for the expansion of technology and the mechanisms for its continual refinement and diversification. As noted by Basch:

> The closely interwoven associations between scientific, economic, political and social forces have controlled not only the growth and shape of the western industrialized world, but to a great extent that of the less developed countries as well.[10]

Since the end of the Second World War, there has been increased emphasis on industrialization in developing countries in an endeavor to attain self sufficiency as rapidly as possible. Developing countries have acquired western technology through capital investments not only in extractive, manufacturing, and agricultural industries, but also in hospitals and medical schools. This acquisition of western technology has generated problems aside from the difficulties in providing the capital for payment. Basch has commented:

> The general absence in lesser developed countries of the broad interlocking underpinning for self sustaining technologic advance increases their dependence upon foreign providers, and the more technology that it is absorbed, the greater will be this dependence as obsolesence takes its toll.[11]

Furthermore, the lack of a modern infrastructure in developing countries, leads to internal social tensions between the small educated elite capable of handling the new technology, and the traditional segment of the population. Heilbronner has drawn attention to the necessity of infrastructure:

> In backward areas, the acute misery that is the potential source of so much international disruption can be remedied only to the extent that rapid improvements are introduced, including that minimal infrastructure needed to support a modern system of health services, education, transportation, fertilizer production and the like.[12]

The progression of technology and the modern industrial society which is its base of support appear to be moving towards greater interdependency and uncertainty. Furthermore, these two characteristics of interdependency and uncertainity seem to reinforce each other.[13] The challenge is to find a constructive path out of the present circumstances, whereby technology can play a pivotal role. There is not the option of a non technological society, but there is the option of technological ways of life considerably different from those of the present. There is the opportunity in planning to develop from the interaction of interdependency and uncertainity the means to coherent choice. This will depend on technological designers to devise alternative technologies which are appropriate and based on a sensitive interpretation of social and political capabilities in the design parameters.

The Concept of Appropriate Technology

What is an appropriate technology? As defined in an Appropriate Technology Primer:

> Appropriate technology is technology which is most suitably adapted to the conditions of a given situation.

> It is compatible with the human, financial, and material resources which surround its application.[14]

The concept of appropriate technology is epitomized in the humanistic/ conservator ethic as it relates to development noted by Schumacher.[15] Drawing on his experiences and observations of developing countries, Schumacher concluded that poverty was the dominant problem and primarily in rural areas. Conventional aid policies drawing on expertise from industrialized, urbanized environments were ill suited to cope with problems of a rural/agrarian nature in developing countries. In tackling problems, Schumacher identified correct choice of technology as a critical factor of development. The most appropriate techniques were likely to be a range of intermediate technologies which responded to local needs. These appropriate technologies would be smaller, cheaper, achieve a more equitable distribution of capital investment, create employment and foster the use of local capital, skills and raw materials. The design of equipment, constructed from local materials would be in harmony with local custom, and reduce both dependency on distant suppliers and demands on scarce reserves of foreign exchange.

An earlier advocate of the concept of an intermediate technology was Mahatma Gandhi. He favored a labor intensive economy with emphasis on village industry to generate full employment, rather than the use of machines. Gandhi's view was that technology should be suited to traditional Indian relationships.[16]

As Schroeder has observed:

> Intermediate technology lies anywhere between the most primitive stone age technology and the most sophisticated space age technology, the precise level being that which is appropriate to the needs of the people in any given area.[17]

Ellis[18] has noted "appropriate technology" is an umbrella term to designate a class of technologies which includes intermediate technology, soft technology, careful technology and alternative technology. The adjective "appropriate" is now most frequently used, not only because it means "suitable", but also by virtue perhaps of its intrinsic ambiguity.[19] Baron, in reviewing the literature available, confirms the fact that "appropriate" technology has achieved respectability as an approach to economic development. Baron has commented:

> It can be clearly seen as a comprehensive concept embracing the political economy of developing countries, unlike its forerunner, intermediate technology, which tends to be concerned mainly with the application of low cost implements and machines in rural areas regardless of the broader political and economic context.[20]

Testa has noted that the idea of appropriate technology is more than a technological theory, and consists of a complete philosophical - economic - technological system. The use of appropriate technologies then becomes an act of profound political, cultural and economic importance. Ellis has observed that the appropriate technology movement can be viewed as a cultural revolution in terms of its impact on technological design, and may well be considered the most important revolution in human thought since the Renaissance.[22]

In rural areas of developing countries, appropriate technology applications will generally reflect some common characteristics. They will as a rule be labor intensive, simple, small scale and of low cost. In addition, other factors need to be taken into consideration in determining the most appropriate solution. The technology should benefit as many people as possible; be adaptable to the changing needs of the community; be in harmony with the local ecology and culture; and be acceptable to the people who will use it.[23]

Appropriate technology is seen as a process of choosing from a broad range of options. The choice of technology should be based not only on technological considerations and sophistication, but also on a sensitivity to economic, environmental and cultural impacts. Some of the available options for appropriate technology can be considered from the following:

1) Adopting or Adapting the Traditional Indigenous Technology -

Local crafts, tools and techniques offer technologies well suited to the region, and can be examined for potential improvement in efficiency. For example, in Malaya, the traditional wooden hoe has been modified by replacing some of the wooden components with metal. This has given the traditional implement a longer life span and increased efficiency.

2) Accepting a Scientific Modern Technology -

On occasion, modern technologies without adaptation can be acceptable. For example, in the more industrialized sectors of developing countries, modern techniques and equipment are used in the petrochemical industry. Possibilities of this nature are generally limited and modern technology requires careful scrutiny for appropriateness.

3) Reviving an Old Technology -

Some of the older technologies from industrialized countries during their development, may have potential for appropriateness in developing countries. For example, water wheels and windmills could be used for the production of mechanical power.

4) Adapting a Modern Technology -

Certain areas of modern technology developed with flexibility and simplicity in mind, may be readily adaptable to a different situation. For example, substitution of a hand lever for an electric motor can be cost saving and also provide employment opportunities.

5) Developing a New Technique -

Possibilities exist whereby past and present technology can be blended to create a new innovation, which responds to the expressed needs of a community. For example, the development and introduction of methane and biogas plants in India has helped to overcome fertilizer and fuel shortages.

6) Transferring Technology Within or Among Developing Regions and Countries -

Similarities among regions and countries can prompt direct transfer of an appropriate technology. For example, bamboo piping used historically for transporting water in southeast Asia, is now being utilized in areas of Africa and Latin America.[24]

Goulet has pointed out that the question is not to choose appropriate technology, but rather to make the appropriate choice of technology. Developing countries need to know the range of technologies available and make the appropriate choice in line with their resource capacities and development priorities.[25] In terms of appropriate choice of technology, Goulet has indicated a pluralistic approach is required:

> The choice lies not between employing only "soft" "appropriate" technologies or solely inappropriate "high" technologies. Rather it is to employ a whole range of instruments embracing improved traditional technologies; others which are modern but small scale, labor creative and indigenously developed; others which are second generation or "obsolete" technologies imported from developed or less developed countries; still others which are the most modern of all; and perhaps even others which do not exist any where but which may be developed to suit special needs.[26]

In the realm of technological development, in addition to appropriate choices of technology, another important factor is to build a cultural base for the population to become receptive and familiar with technology. If development strategy includes goals of social equality and participation, it is necessary that there is a broad dissemination of technology. Local people are often more competent than anyone else to choose the technologies appropriate to their situation. It is apparent the three critical elements of appropriate technology are choice, generation and dissemination, and that these must be interlinked.

Singer[27] stated that the first determinant of a country's appropriate technology is its factor endowment, referring to the relevant portion in which labor, capital, land, skills and natural resources are available to the economy. While factor endowment determines appropriate technology, the choice of technology governs the evenness of technology in different sectors of the economy and therefore income distribution.

Jequier[28] commented that appropriate technology should not be viewed as second rate nor second best technology. Designing a good appropriate technology is in many ways as complex and challenging from the conceptual point of view as any modern industrial innovation. Appropriate technology should also not be over-estimated, and should not be considered a universal substitute for conventional technology. Furthermore, appropriate and modern technologies can be seen as complimentary rather than contradictory.

Despite general enthusiasm for the concept of appropriate technology, there has also been criticism notably from developing countries themselves. They have noted that the primary advocates of appropriate technology are development experts from industrialized countries, who attempt to persuade them that modern technology is harmful to their development. They consider appropriate technology as second rate and view it as an example of "technological imperialism".[29] As a result, Third World critics see the promotion of appropriate technologies as a ploy to keep developing countries disadvantaged technologically compared to the West.

Another criticism put forward is why should developing countries accept second class options in technologies, which the industrialized countries do not use themselves. This appears to be the political argument used by those concerned with the economically advanced sector of developing countries, who assume that modern technology as used in industrialized countries is the only answer. This argument is of little concern to the bulk of the population who do not have the opportunity of any choice at all.[30] Appropriate technology considers a range of alternatives, and does not specify second hand or obsolete equipment for developing countries, unless this appears to be the best solution for the local situation.

Besides the theoretical criticisms of appropriate technology, there are practical objections which provide resistance to the concept. Appropriate or "low" technologies are not a feasible proposition to large corporations, which need to sell their products at a certain price to cover a large capital investment. However, it has been noted that large corporations have been become more willing to pass on to smaller companies appropriate technologies which they have discovered as byproducts in their research work, but decide not to produce for economic reasons. [31]

Further arguments against appropriate technology have been noted:

1) If new technologies are to be learnt, emphasis should be placed on modern technologies, as the intellectual effort required is similar.

2) The cost of installation of older technology may be lower, but because of lower productivity the actual cost per unit produced will be higher.

3) Increased employment can only be obtained with increased productivity with modern technology leading to lower costs and increased consumption, and thus the ability to compete in export markets.

4) Obsolete equipment leads to higher maintenance costs with the likely unavailability of spare parts in comparison to modern equipment.

5) Many communities are prepared to pay the price of social disruption to improve their standard of living as rapidly as possible through advanced technology.[32]

Singer has noted, although developing countries may subscribe to the aim of technological autonomy and independence, they view technological autonomy as sharing control of the same technology, and this is an inherent error. As Singer commented:

> What is needed is not a second-tier, primitive technology but an equally modern, equally efficient but different technology - a technology designed to produce different products (those catering to the basic needs of poor people) with a different combination of resources, in different locations and with different forms of business organization.[33]

It is apparent that technology in and of itself is no panacea, and it must be considered in relation to the social setting to which it is being transferred. Appropriate technology can be said to represent what could be called the social and cultural dimension of innovation. Assessing the appropriateness of a technology, brings into play value judgements, not only in terms of those who develop it but those who will be using it. When ideological considerations enter the arena of choice, as so often happens, appropriateness at best is a fluctuating concept. In terms of the transfer of appropriate technology the crucial aspect of technology selection lies not only in its economic viability and technical soundness, but in its adaptation to the local social and cultural environment.[34]

Technology Transfer

Technology transfer is a complex process comprised of distinct components and many attributes. Mogavero and Shane[35] have defined technology transfer as the use of knowledge in the sense that the transfer of technology really means the transfer of knowledge. Perlmutter and Sagafi-Nejad have noted:

> Technology transfer refers to the process whereby technology is moved from one physical or geographic location to another for the purpose of application toward an end product.[36]

This transfer can take place domestically, or across national boundaries from one country to another.

Goulet views technology transfer as the transfer or exchange from advanced to developing countries of the elements of technological know-how which are required for establishing and operating new facilities, and which are in short supply or unobtainable in the developing economies. This encompasses the know how required for feasibility studies, choice of technology, design and construction.[37]

Transfer of technology can be described as occurring when technology is transmitted, received and applied. Transfer signifies a process linking the technology supplier to the technology user. The four principal actors in the transfer process have been identified as 1) the technology supplier, 2) the environment of the supplier, 3) the technology recipient or user, 4) the environment of the recipient or user.[38] As Wallender commented:

> Transfer of technology can occur only when there is a source supplying the technology and user receiving the technology. Technology suppliers and users may be public or private profit making or non profit enterprises. The environments of both users and suppliers are conditioned largely by general economic conditions and by the governmental regulations affecting technology transfer.[39]

Technology transfer refers not only to the transfer of equipment or related know-how but also to a certain level of knowledge regarding the basic scientific concepts on which technology is founded. Bennazzouz and Baez addressed this issue in technology transfer:

> Technology cannot be transferred without some degree of adaptation. We have to know what is being transferred, and how it is being transferred. Adequate communication is considered indispensable and to be adequate, communication must be more than a matter of words. If we are to understand each other better, the words exchanged must represent the same ideas for the persons involved in the transfer process.[40]

Brasseur[41] has noted that communication problems in technical assistance projects arise principally from a lack of understanding of the dynamics of the transfer of knowledge itself. This occurs as a result of sociocultural factors, lack of understanding of the process of transfer and the language gap. Professionals in western industrialized countries usually interact with people whose qualifications and cultural background are similar. The scope of communication and the need for communication skills are therefore minimized, as the parties understand both the concepts and terminology used. In technical assistance projects in developing countries this is often not the case. The consultant going to a developing country may speak a different language, and be interacting with people with a lower professional qualification than anyone the consultant is used to dealing with in his home country. Communication is thus hampered by the combination of the language gap and difference in level of professional knowledge. The transfer of knowledge is basically between a transmitter and a receiver. To ensure the highest possible level for messages to be transmitted, received and understood Brasseur has noted:

> ... the optimum level of communication is the highest level of sophistication either of the transmitter or the receiver, which ever is the lowest.[42]

Brasseur emphasized the need for the consultant expert to be familiar with the language of the country, be required to learn communication techniques, and to rediscover their own discipline at an intermediate level of sophistication. This would enable them to communicate with people at a different level of understanding, and to design efficient ways in which to transfer advanced knowledge.[43]

The role of culture in technology transfer is of major importance. Foster[44] has noted that the most successful technical specialists working in developing countries have established local bearings before undertaking major activities. They begin their work cautiously, acquire an understanding of the culture of the people and search for an explanation of traditional ways. Before technology transfer occurs, it is essential to know why things are done as they are, before attempting to change them. The responsible technical specialist will endeavor to adapt scientific technology and methods to the ecological, social and economic environment of the developing country.

Myrdal[45], in reviewing the place of technology transfer in the history of economic development in the Western world, noted that it was often advantageous to be a late comer. Britain, where the Industrial Revolution was launched and the birthplace of many technologies, has been surpassed time and again by other Western nations. These nations, however, were similar in respect to being located in the Temperate Zone, their populations were generally literate, population growth was controlled and they had access to competitive, capital markets. Moreover, the technologies they already possessed were of a higher level and more diversified, so they were favorably situated to benefit from a transfer of technology. During the early industrialization period of the 18th and 19th centuries, technologies were of a simple mechanical type, in contrast to today's technologies which emerge from current scientific discoveries. This relationship to science constrains its transferability, compared to the simple technologies of the earlier scientific revolution period. The transfer of technology therefore occurs today in a setting of more rapid advances in science than at any other time in history. The developing countries must now face a much higher level of science and technology, which is continuing to change rapidly, and which makes the task of adoption or adaptation increasingly harder. It has been argued that developing countries can shortcut the evolutionary process, and catch up to developed countries by transferring the latest technology. This may no doubt be true in the area of computer technology, but has little validity in other fields. The so called advantage of being a late comer in the area of technology may prove to be an illusion for developing countries.[46]

Goulet has drawn attention to some major zones of conflict regarding international technology transfer:

1) One view is that technology is proprietary knowledge to be bought and sold, whereas another view is that it should be freely available for dissemination.

2) The built in propensity of technology transfer, as it is currently conducted, to increase social inequities among classes in the populations of developing countries.

3) The aspirations of developing countries to achieve technological autonomy, contrasts with the prohibitive cost of importing technology.

4) The tendency of high technology to be standardized for the sake of efficiency and to avoid duplication costs in research and

development. This contradicts with the expressed desire of developing countries to maintain their cultural diversity.

5) Appropriate technology is inexpensive, labor-intensive and utilizes local materials. However, most leaders of developing nations want high technology, so that their nations will not be considered second rate powers, technologically.[47]

Ramaswany, in noting the pitfalls in transferring technology from the industrialized world to developing countries, has outlined the advantages of developing countries transferring technologies among themselves. Utilizing the less expensive training facilities of a neighboring developing country where conditions are similar, would help to alleviate the problem of "brain drain" and alienation. Consultants from similar countries adapt more readily, and produce results more appropriate to the situation in a shorter period of time. It may be possible to import a labor intensive technology from another developing country, which is further ahead on the road to industrialization. Furthermore, transfer of technology among developing countries has the advantage of shopping in a buyers market. The factors which mitigate against this approach between developing countries, include the preference for technology from developed countries; the quality of technology in the developing world is often considered suspect; developing countries cannot match the terms developed countries can offer; developing countries lack knowledge about each other; and finally, developing countries who could export expertise have not formed suitable consultancy firms.[48]

Goulet has noted that the channels through which technology is transferred is of two types - institutional and modal. Institutional channels include technical assistance provided by agencies, universities, foundations and volunteer groups. Modal channels consist of direct investment by a multinational corporation into its subsidaries, patents, licensing agreements, servicing contracts, training programs, and provision of technical manuals.[49]

The path to developing an indigenous technology can be a lengthy process, and dependent on the initiative and competence of the people in the particular country. Magdoff[50] has observed that if a developing country is to become economically and culturally independent, it must do its own learning and on its own terms. The Japanese shunned foreign investment and learnt Western technology by their own route. The learning process can be slow, working through mistakes, to acquire the mastery of technology. In China, the steps taken to develop an indigenous technology, have included borrowing technologies from the West yet creating conditions for true independence. Capital intensive technologies are used in capital goods industries to become internationally competitive and up to date with modern innovations. However, in consumer goods industries, some efficiency is sacrificed in using local materials and labor intensive technologies to secure full employment and participation of the workers in decision making. In viewing the Chinese approach to technology, Goulet has commented:

> An appropriate technology policy considers a whole range of tools, organizational systems, and work modes whose degree of appropriateness is to be judged sector-by-sector, industry-by-industry, and product-by-product in accord with broad value options taken by society and expressed in precise development strategies.[51]

For successful technology transfer to occur, several conditions need to prevail. Firstly, the recipent should have a basic understanding of the whole process, and therefore be able to take the necessary steps to pursue the connection among details. Secondly, if the recipient of the technology has assisted in the formulation of the problem and raised the necessary research questions, successful transfer is more likely to result. If however, the recipient has not participated in problem formulation, there may be too great a distance between the research aspects and the realm of practical application for transfer to succeed.[52]

The International Transfer of Medical Technology

The transfer of inappropriate medical technologies to developing countries has been noted to be one of the foremost problems in international health.[53] Technology transfer is not the neutral process it was assumed to be previously, but involves a complex set of factors. Bader has observed that the international transfer of medical technology to developing countries occurs at four levels,

1) Medical education, research and missions.
2) Multinational corporate transactions.
3) Technical assistance projects of the World Health Organization.
4) Bilateral foreign aid programs.[54]

Medical Education, Research and Missions

International medical values in training and curricula continue to place emphasis on curative care rather than preventive care, and to focus on sophisticated medical technology in the treatment of disease. These values are transmitted to Third World medical students, who go to developed countries for training. Some countries, namely Tanzania and China, by altering their medical curricula to a preventive care focus have successfully trained a number of health auxiliary personnel with subsequent progress in coverage of basic health care needs.[55] It is apparent Western medical school curricula with its continuing emphasis on sophisticated technology requires adaption for application in developing countries.

Medical research, a prominent aspect of medicine in developed countries, generates associated high technology and demands considerable investment of health care resources. Developing countries of necessity should place lower priority on medical research, which draws on the limited health care budget. Research which is funded by international agencies should focus on particular needs of developing countries, such as endemic and communicable diseases.

Medical missions in developing countries historically have concentrated their efforts on curative services modelled on Western medical approaches. Despite their contribution, notably in famine relief, medical missions are frequently located in isolated areas resulting in expensive duplication of services and equipment and lack integration with the national health systems of countries.[56] However as Basch[57] has observed, with decolonization, rising nationalism and increased numbers of local health professionals, the role of the medical missionary has sharply declined in the majority of developing countries. In many nations, such as Tanzania, former mission hospitals have been absorbed into the national system and their hospital personnel placed on salary or contract.

Multinational Corporate Transactions

Multinational corporations play a major role in the transfer of medical technology to developing countries. As noted by Elling:

> Multinational financial, industrial, and agricultural corporations are today's most powerful agents for extending the business of core nations, literally, into underdeveloped peripheral and semiperipheral nations.[58]

These corporations market their products from a profit standpoint without sufficient consideration of the social consequences. The inappropriate uncontrolled marketing of pharmaceuticals, infant formula and medical technology have been cited as examples of multinational corporation practices in the developing world.[59] The dumping of outmoded and banned dangerous drugs and pesticides with failure to transfer knowledge and control of the hazards involved, has drawn particular attention.[60] In terms of the lack of regulation of these practices Bader has commmented:

> The international health establishment reveals a grave defect in its limited power to regulate these transactions, since the health needs of individuals in the developing countries ostensibly receive a lower priority

> than the profit statements of multinational corporations that specialize in medical technology.[61]

Multinational corporations supply new hospitals in the developing world with the same diagnostic and therapeutic technology found in industrialized countries. Scarce resources are thus spent on inappropriate equipment which will be redundant and obsolescent within a short period of time.[62] Few resources are then available for preventive and primary health care services which can benefit the population at large. Technology developed in the West to overcome high labor costs, does not utilize the human resources of developing countries which is their greatest asset. It would appear multinational corporations have not been innovative in tailoring technology to the needs of the developing world.

World Health Organization Technical Assistance

Another agent of international medical technology transfer is the direct assistance by the World Health Organization. This organization acts on requests for technical assistance from member countries, and in so doing has a significant affect on health care systems in developing countries.

Bader, in reviewing WHO assistance to Cuba and the Phillipines in the period 1957-1974, noted that project requests had reflected the dominant political ideology of health care in each nation.[63]

> Cuba has placed public health services, including nutrition and environment health, at the core of its WHO technical assistance projects, while the Phillipines has invested in prestigious pilot projects, education fellowships at the University of the Phillipines and a blatantly pro-urban environmental health care system, the Manila sewage plan.[64]

It would appear that Cuba used WHO technical resources appropriately, while in contrast technical assistance given to the Phillipines was misplaced. Bader concluded that the role of the World Health Organization in the development of international health services has been a disappointment, in that it perpetuates maldistribution of health care resources in such countries as the Phillipines.

On the role of WHO Elling has hypothesized:

> Possibly world technical and information exchange mechanisms such as WHO play a role in establishing an inappropriate medical cultural hegemony in underdeveloped countries through the prestige of these bodies and the imposition of western definitions of medical-public health matters.[65]

Bader has noted that according to current international law, WHO does not have the political and legal jurisdiction to enforce transfer of appropriate technologies to developing countries. Member nations retain sovereignty over health issues within their boundaries and are reluctant to relinquish any aspect to an international organization.[66]

Bilateral Foreign Aid Programs

Foreign aid agencies from industrialized nations have become officially involved in the health of developing countries through bilateral arrangements. Foreign aid is devoted to official development assistance (ODA), a term of imprecise meaning, which embraces work in agriculture, education, health and small industry. Countries such as the United States, Canada, Denmark, Norway, Sweden and the United Kingdom have established agencies which operate in developing countries. Until recently, Canada has not been a major actor in Third World affairs and, historically, Canada's relations with developing countries have not been central to its foreign policy. As a middle power without colonial traditions, Canada's links with the Third World have been weak in comparison with other industrialized countries.[67] However, in the strategy for International Development Cooperation 1975 - 1980, it was observed:

> Yet Canada is potentially important to the Third World; it has the capacity to have a significant impact upon the international community in the field of development cooperation. Its past development assistance performance, as well as its lack of imperial and colonial ambitions, has gained Canada a favourable reputation as a relatively progressive and unbiased participant in Third World affairs. For historical and cultural reasons, Canada also enjoys special links with Commonwealth members and Francophone countries out of proportion to its economic power.[68]

Of recent years, Canada has placed increasing emphasis on its relations with the Third World in the field of international development cooperation. This is apparent in the enlargement of Canada development assistance activities through the Canadian International Development Agency (CIDA) and the International Development Research Centre (IDRC).

CIDA has three channels through which Canadian resources, both human and financial, are put to work in the Third World. These channels which are responsible for the transfer of development assistance are the Bilateral, Multilateral and Special Programs Branches. The Bilateral Branch oversees the design of programs

Canada operates in conjunction with each recipient country. The Multilateral Branch operates in international cooperation with technical assistance programs of the United Nations and other disaster and relief organizations. The Special Programs Branch establishes cooperation between government and private agencies such as Canadian non-governmental organizations (NGO's) and international non-governmental organizations (INGO's) working in the Third World. Total expenditures for CIDA activities in the 1980-1981 fiscal year was $1.24 billion.

The International Development Research Centre (IDRC), is a public corporation created by the Parliament of Canada in 1970, to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in five sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences and communications. Although IDRC is financed by the Parliament of Canada its policies are established by an international Board of Governors. Since 1970 IDRA has funded more than 1250 projects, and the resulting research findings have constituted a body of knowledge in the development field. In the 1981-1982 fiscal year the budget for the health sciences division program consisted of $5.9 million for 37 projects in communicable and non infectious diseases, health care delivery, water supply and sanitation, fertility-regulation and occupational health.[70]

United States foreign aid is channeled through the Agency for

International Development (AID) of the U.S. Department of State. Critics of the U.S. aid program declare that monetary funds are sent out of the country for the program. Contrary to this criticism, AID monetary funds are used to purchase goods and services from over 4000 American corporations and 1000 private institutions for technical and professional services for projects abroad. Furthermore, AID contracts with American universities and technical service organizations for certain projects. Rather than a net loss to the U.S. economy, U.S. foreign aid in fact finances a substantial percentage of U.S. exports to developing countries.[71]

A further criticism of U.S. foreign aid is that it encourages psychological and technological dependency in developing countries. Psychology dependency arises from the view that products manufactured in the West are superior, and this view has been fostered historically by colonial imperialism. Moreover, the arrogance of Western specialists concerned with the installation of modern technology in developing countries reinforces this dependency on the West for technology.[72] Technological dependence results from multinational technology being protected by patent rights and exclusive licenses. Transfer of technology contracts, in many cases, prohibit the use of transferred technology for producing exports in developing countries. As Bader commented:

> Imported technology facilitates the development of "enclave economies" in the developing world, economies with sectors "modernized" by virtue of their dependence on international capitalism but unable to contribute significantly to scarce foreign exchange earnings.[73]

Furthermore, the lack of bargaining power of developing countries with multinational corporations is reflected in transfer of technology which can be obsolete, over priced, and unsuitable for use in a labor intensive economy.[74]

Developing countries are reticent to pursue legal recourse against multinational corporations at the risk of losing further foreign aid and investment opportunities.[75] From a control point of view, it has been noted that some multinational corporations possess more assets than many developing countries collectively together.[76] It is apparent where an unregulated system of medical technology exists, the benefits of foreign aid usually accrue to the multinational corporations rather than to the population of developing countries.

Considerable attention in the literature has been directed to the transfer of human capital - "the brain drain", from developing countries to industrialized countries.[77] Less attention has focused on the transfer of physical capital, in terms of medical equipment, from industrialized countries to developing countries. In one of the few empirical studies on the subject, Piachaud investigated the extent to which eight modern medical techniques had been introduced into developing countries in 1977.[78] In only seven of the forty countries who responded in the study, the techniques had not been introduced. In three countries all techniques had been introduced. In one respect, the study indicated the extent to which developing countries lack the medical techniques readily available in industrialized countries. However, it also suggested the rapidity of diffusion of medical technology, in that many poor countries had acquired recent medical techniques. Piachaud attributed the rapid diffusion to possibly many factors including medical education oriented towards industrialized countries; overseas aid programs favoring high profile sophisticated technology; physicians in developing countries having practiced or planning to practice in industrialized countries; and finally, many developing countries focusing on the development of science and technology and the best possible health care services available.[79] The study brings into question again the relevancy of the latest techniques in terms of appropriateness, cost and contribution to health improvement of the total population in developing countries.

It is apparent in developing countries where population growth is rapidly outstripping economic growth, it is essential that the economy utilize labor intensive technologies in all sectors, including health care. The use of rural auxiliary health personnel for the delivery of primary health services has been used extensively in countries such as Tanzania and the People's Republic of China. The training costs for auxiliary personnel is infinitely lower than the cost of educating physicians in developing countries.[80] To complement a primary health care system, an appropriate health care technology is required incorporating simple diagnostic tools and procedures, limited pharmaceutical options, rural health centres and integration of traditional healers into the health care system.

In terms of appropriate health care technology relating to primary health and rural development, the World Health Assembly in May, 1976 established a program of Appropriate Technology for Health (A.T.H.). In 1977 the foundations were established for the first program of A.T.H. for 1978 - 1983. The ultimate aim of the A.T.H. program is to promote national self reliance on problem solving in primary health care delivery, and to reduce the existing dependence of developing countries on industrialized countries for technological support. Emphasis is to be placed on measures concerned with improving health of underserved populations, and on procedures which encourage the decentralization of services and sharing of information. The four principle functions of the A.T.H. program are viewed as: direct cooperation with countries; collaboration with appropriate technology groups and with selected national institutions; evaluation of progress; and dissemination of information.

Current WHO activities in appropriate technology include special programs for health laboratory technology, basic radiological technology and immunization technology. The 1978-1983 medium term program has focused on a wide range of activities of a promotional nature, including the dissemination of information. Already an A.T.H. Directory, containing a list of institutions and persons involved or interested in working in the A.T.H. field, has been published. It is intended that an updated and expanded version of the Directory will be published twice a year.[81]

On the role of the World Health Organization, Bader has stated:

> The World Health Organization should assume leadership in developing appropriate technologies, and should serve as a technological clearing house for the transfer of these technologies. In simple terms, WHO must attempt to minimize the profit motive in international health technology by advising developing countries to choose the least capital intensive technologies. In this way, it could become the vanguard of an international conscience for social development.[82]

Appropriate Health Technology

Health technology, in the broadest sense, has been described as the systematic application of knowledge in the health and related sciences to the solution of practical tasks. It covers a complex of actions with each action based on a combination of methods and techniques using equipment, diagnostic and therapeutic materials as required.[83]

Parker[84] has observed that the term "health technology" can be applied at three levels of specificity. At the general level, it can be used to refer to the entire process of the application of scientific knowledge and skills to achieve set objectives. In a more specific frame of reference, it can denote an action or set of actions to attain a predetermined objective. The narrowest use of the term, is when individual components of an action such as a method, technique or device is classified as a health technology. Parker noted the use of the term technology for all three levels of meaning tends to confusing, and suggested the term should be used only in the overall or intermediate sense.

The range of technologies employed in primary health care need to be broad, in keeping with the broad objectives of primary health care which include care for the sick, maintainence of health and prevention of illness. The central modalities used in intervention in primary health care will also draw on the technology of other fields. As Parker et al have commented:

> In addition to techniques derived from the biomedical and health sciences, those concerned with communication, training of health personnel, delivery of health services, and alteration of physical and social environments, as well as skills in working with people, must be included.[85]

Health technologies, within a primary health care framework, can also be categorized according to their derivation. These could be derived from:

1) Technology emerging from scientific based health care - for example, medication therapy or immunization interventions.

2) Technology using indigenous methods and techniques - for example, traditional medicine, and care from indigenous healers.

3) Technology emerging from disciplines other than health care - for example, satellite communication, television or radio.

4) Technology no longer used in industrialized countries but with application in certain situations in developing countries - for example, wind and water power as an energy source for a village.[86]

Primary health care technology can also be viewed as to whether it is discipline - specific or disease - problem - specific. As an example, medical technology, health education technology or community organization technology would be discipline - specific. However, the technology used in smallpox eradication or in maternal and child care would be classed as problem - specific.[87]

In choosing an appropriate health technology, a developing country may decide on one of the following approaches:

1) Devise its own technology.

2) Utilize a technology created elsewhere which suits its needs.

3) Modify an existing technology to suit the particular conditions of the country. In terms of modification of a technology to make it appropriate, Parker has developed a decision tree analysis path incorporating questions related to particular factors at each stage of the decision making[88]. In actual practice, some decisions will need to be made concurrently. Modification in the final analysis will balance many factors. The factors to be taken into consideration for modifying a technology are the following:

1) Effectiveness and safety - the technique selected must produce the desired effect within an acceptable margin of safety and effectiveness otherwise it should be discarded.

2) Complexity and simplicity - a modification in technical complexity will represent a more effective or more appropriate approach. Simple measures developed locally may be the best solution, or equipment and pharmaceutical drugs of a highly technological nature may be required which are simple to use under the particular circumstances.

3) Cost - consideration of cost, both initial and recurrent, is of major importance if health service coverage is to be extended to the entire population. In developing countries, capital and recurrent costs are more important than labor costs. As a result, health technology may require modification to reduce overall capital costs, and also to utilize the existing labor resources.

4) Adaptability - an important aspect of health technology is whether it will function under the circumstances of delivery. The technology must be feasible in terms of compatibility with local conditions, and acceptable to the population served. Selection of a health technology must be based on an evaluation of the balance between these factors, and in the final analysis will depend on social judgements and also scientific fact.[89]

A related issue in the discussion of appropriate health technology is the standardization of health technology. Appropriate standardization can reduce costs, and improve the coverage and quality of services to areas hampered by distance, limited staff and supervision. As aspects of health care increase in technical complexity, the more valuable standardization can become. A pharmaceutical drug for the Tropics which can maintain its integrity under humid conditions will require development, production and standardization at a higher level. Certain vaccines, standardized equipment lists for medical workers, and protocols for treatment of particular diagnoses can be usefully standardized at the international or country level.[90] Hopper[91] has drawn attention to the advantages of standardization, and noted that it is a prerequisite to successful transfer of technology.

King and Martodipoero have described the standardization of health actions with complementary and subsidiary appropriate technologies as "microplans":

> A microplan is defined as an integrated set of components (instructions for technologies, equipment lists, teaching aids, evaluation instruments, etc.) prepared nationally to support a particular health subsystem.[92]

A particular microplan or package therefore combines in a protocol multiple components such as a description of the technologies, the education component, a training manual, lists of equipment/drugs/supplies, recommended facilities and a planning and evaluation instrument. The core of the microplan is in its system of appropriate technologies. Microplanning begins with a choice of a limited field such as maternal care. The appropriate technologies in this field are joined together into a system and described in a worker's manual used for training purposes. Manuals are also supplied for supervisors and teachers, appropriate to these roles for overall coordination. Since diseases and the technologies for their management are similar throughout the developing world, the merit of microplanning is that its application could be considered in many countries.[93]

Parker has observed, however, that in other aspects of health care such as health education and community development, the question of standardization becomes a more complex issue. Under these circumstances, rather than compliance with a fixed standard, standardization should be offered as a guideline for comparison.[94] This has the advantage of allowing local participation in the development and tailoring of services to meet local needs. Standardized protocols, based on the information available and adapted appropriately to particular settings will undoubtedly continue to be of benefit to developing countries.

Selection of an appropriate health care technology requires a planned approach in terms of process. Parker has noted the necessity to examine key decision points in the selection process.[95] The sequence of health technology selection would consist of:

Decision Point A - Problem Selection.

This aspect concerns choice of the health/disease problem for attention based on resources available and the needs of the people.

Decision Point B - Choice of Interventive Stage.

Each health/disease problem has several different points that intervention can be taken. Each interventive stage must be examined for evidence of effectiveness in order to narrow the choice.

Decision Point C - Choice of Alternative Strategies.

Most health/disease problems can be managed by several interventions. The decision on the preferrable method will involve feasibility and acceptability factors obtained by pooling of information from health care workers and the people themselves.

Decision Point D - Technology Selection.

Implementation of the strategy chosen, in terms of the appropriate combination of methods, drugs, and techniques that will be used. Factors of effectiveness, cost, safety, acceptability and feasibility will be considered for each component action.[96]

It is apparent that successful implementation of an appropriate health care technology program among developing countries requires international efforts for coordination. This would involve the collection and diffusion of knowledge already known, promotion and development of new technology, and cooperative efforts with countries in planning and using appropriate technology. Goulet has proposed three categories of assistance to developing countries by international agencies. These include the creation of data banks containing obsolete proprietary knowledge and general knowledge; preparation of catalogues listing the complete range of technologies available; and the development of technology transfer centres with consultancy services designed for easy access of information.[97]

There is a need to assess and choose in the transfer process from a range of alternative modern technologies, to scale technology to local needs and to foster innovation in the extension of traditional technologies. It is essential to develop ways of acquiring greater control over the technology transfer process, so that this process serves the national interest of each country. Initially, it was believed that the transmission of technology to developing countries was a simple process in terms of provision of scientific innovation and practical application from industrialized countries. It is apparent the process is infinitely more complex and that there are cultural, value, ethical as well as technical dimensions to the process. One fundamental need is to discard the indiscriminate acceptance of technology from industrialized countries. In terms of health care technology transfer, systematic problem solving needs to be undertaken by each country to select the precise technology to meet local needs. It is clear a crucial aspect is the necessity to match appropriate health care technology transfer to the needs of the people.

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CHAPTER IV

COMMUNITY DEVELOPMENT AND APPROPRIATE HEALTH TECHNOLOGY TRANSFER

Technology Transfer to Developing Countries

Technological development in developing countries can be interpreted from several perspectives. The recipients can view technological development as the learning of new techniques, the acquisition and facility in the use of new tools, and the changing customs and attitudes which impinge on their daily lives. To the technical specialist with the values of his professional subculture, development work can be seen as the successful diffusion of scientific knowledge and the behavioral change associated with this knowledge, where it had not existed previously. The social scientist, in his frame of reference, considers technological development as the specific changes which occur in the structure of society, the patterns of cultures and the nature of individual behavior. Change, in this sense, would be described as planned or guided, to distinguish it from spontaneous or evolutionary changes which continually occur.

Technological development programs, within this context, represent planned sociocultural change, understanding that a psychological dimension will be associated with the change processes. Therefore development is much more than an overt acceptance of material and technological improvements. It becomes also a cultural, social, and psychological process. As Foster observed:

> Associated with every technical and material change, there is a corresponding change in the attitudes, the values, the beliefs, and the behavior of the people who are affected by material change. These non material changes are more subtle. Often they are overlooked or their significance is underestimated. Yet the eventual effect of a material or social improvement is determined by the extent to which the other aspects of culture affected by it can alter their forms with a minimum of disruption.[1]

Less would appear to be known about the cultural, social and psychological aspects of technology transfer than about the purely technological aspects. Although the existence of human factors in technology transfer have been increasingly recognized, all too often lip service is played to this aspect in sketchy preparation of personnel engaged in field work. Furthermore, the specialist involved in technology transfer is profoundly influenced by the value system of his own professional training and cultural system. These factors can be as much a barrier to change, as can the cultural forms of the target group in the field study. Another important human problem in the technological change is an ethical one in deciding what is good for other people. The ethical question should take into account the role of the state in its rights and obligations, but particularly the people themselves in the decision making process. The wisdom of tradition still carries weight among many people in less technologically advanced lands, and new innovations may set people on guard and therefore become reluctant to accept change. In regard to health methods Foster and Anderson have commented:

> Faith in the correctness of one's own medical and health beliefs probably characterizes all people; it is one of

> the most important symbols around which the group organizes its perception of its ethos, its uniqueness, its vital essence. Therefore to abandon traditional health beliefs is a far greater step than to accept a new mode of therapy; it means relinquishing a major support to a group's sense of identity and view of itself.[2]

Therefore at a period of change all kinds of rationalization and accommodation are made to justify continuing faith in the old system. Furthermore, motivation for change may be strong, but unless the suggested innovation fits into local, cultural, social and ideological values, it will not be accepted.

Foster [3], in noting bureaucratic barriers to change, reviewed three approaches to technical assistance and international development. The early approach was the primitive technical assistance model adopted by private organizations such as the Rockefeller Foundation, the Near East Foundation and specialized agencies of the United Nations. It was characterized by an ethnocentric premise, in that techniques and programs successfully used in developed countries, could be directly transferred to developing countries. Early program planners assumed technologies were absolutes, separate from culture, and equally applicable and suitable for all sociocultural and economic environments. The assumption was that Western methods were superior, and people in developing countries, given the opportunity, would adopt them readily.

This proved to be an inadequate model on which to base technical assistance programs. It has been replaced by the anthropological technical assistance model which appeared in 1950. This model postulates that the difficulties in the diffusion of technologies lies within the society and culture of the target group. Programs for technology transfer as a consequence should be adjusted to the local cultures. The assumption of the model is that the people are keen to improve their living standards, and will adapt if the innovation is perceived to be advantageous and the social cost in disruption of traditional patterns is not too great. Therefore the recipient peoples need to be studied from the social, cultural and psychological standpoint to ensure the technological innovations will be functional and tailored to local cultural expectations.

Although this has represented a sophisticated approach to the problem of technology transfer, a major shortcoming in the model emerged. This was noted to be the failure to take the donor culture into consideration in terms of the administrative organization and the technical experts who will be involved in the transfer process. The donor culture becomes as much a part of the change process as the recipient culture. Major barriers to change reside in the structure and dynamics of donor organizations, and in the culture and attitudes of technical staff. The donor-culture model recognizes that if technical assistance and technology transfer programs are to be more effective, greater knowledge is required concerning donor organizations as well as knowledge of the recipient culture.

In the confrontation of individuals and groups with technological change, central to the process is the diffusion of resources across boundaries from one group to another. Community development can be considered as a specific approach to guide the central aspects of this process of cultural diffusion in technological change.

The Concept of Community Development

The origins of community development stem from the union of community organization and economic development.[4] This linkage of community organization and its focus on local action and resources, with economic development which centers on national planning and allocation of resources, is contained in the United Nations definition of community development:

> The process by which the efforts of the people themselves are united with those of governmental authorities to improve the economic, social and cultural conditions of communities, to integrate these communities into the life of the nation, and to enable them to contribute fully to national programs.[5] (U.N.O. 1956)

Community development also owes much of its heritage to rural sociology, adult education and the extension movement.

Historically, the term community development from an international perspective, described government programs which stimulated local initiative, as developed by the British government in its dependent colonial territories in the 1920's. Encouragement was given to an education policy to help alleviate the problems of illiteracy and poor conditions existing in the colonies by the promotion of agriculture, native industry and health programs. The importance of working with the local communities to assist them in developing their economic and human resources was emphasized. The term "community development" was first used officially in 1948 at a Conference on African Administration sponsored by the British Colonial Office at Cambridge University.[6] Community development was proposed then as a means to generate African initiative in local government in the colonial territories which were preparing for independence. In the United States, the term and activities to which it was applied, became synonymous with the work of the International Cooperation Administration in countries overseas. Within the United States itself, it referred to community participation in municipal planning, and was also closely related to rural sociology. The term and concept spread rapidly to a number of external donor agencies and national governments.

As a consequence the community development approach in the developing world has its early roots in the programs of the British Colonial Service principally in Africa and Asia, the United States and European overseas voluntary agencies, and in the British and United States domestic programs in adult education and social welfare. India, more than any other country, has had well documented experience in community development and rural reconstruction. Gandhi and Tagore were influential in fostering early rural development activities in India and significantly affected the direction of the United Nations and the United States in the field of community development.

Many definitions of community development have been proposed at various times in different countries. Within these definitions certain common elements occur again and again in the literature. As Carey observed:

> These elements together provide a generally acceptable definition of the process; they are: 1) community as the unit of action; 2) community initiative and leadership as resources; 3) use of both internal and external resources; 4) inclusive participation; 5) an organized, comprehensive approach that attempts to involve the entire community; and 6) democratic, rational, task accomplishment.[7]

The term "community" has usually referred to people who live in some spatial relationship to each other and share similar interests and values. However, as Roberts [8] has pointed out, there are disadvantages in considering geographical locality in the context of "community". Geographical locality may have significance in self contained rural villages, but in large urban centers geographical boundaries have little meaning. Furthermore, contemporary development in communications enable people who are separated by distance to share similar values and concerns in the wider context of development. In this sense, geographical identity becomes secondary to other factors which contribute to the common set of objectives for that group of people. An essential component in the formation of a community around a common set of objectives is that of group identity. As Roberts commented:

> So the community exists when a group of people perceives common needs and problems, acquires a sense of identity, and has a common set of objectives.[9]

The second important element of community development is local initiative and leadership, which must come from within the community itself. If leadership is not apparent then leadership training becomes a priority in community development work in that setting. The third aspect of community development concerns the use of resources from both within and outside the community, which recognizes that many resources and decisions pertaining to the community are made outside its jurisdiction. The fourth element of inclusive participation signifies that all members and groups within the community have the opportunity of participation. Membership in particular activities will fluctuate depending on the level of interest within a community at any given time.

Associated with inclusive participation is the element of an organized, comprehensive approach which strives towards specific goals. Within this framework, the final aspect concerns the need for a democratic, rational, task oriented perspective towards community decisions.[9]

The aim of community development can be seen then to increase local self sufficiency, enhance local capacities for solving problems, and to encourage material and non material conditions of life within a community by active participation and initiative on the part of the community. As Lotz observed:

> The basis of a successful community development approach rests on a planned program to meet the needs of local people, reliance on self help, access to technical assistance and accurate information, and an integration of specialist services around the agendas of the community rather than of those of outside agencies.[10]

Sanders [11] has taken a broad interpretation of the concept of community development and views it as a process, a method, a program or a movement with each emphasizing a certain aspect of community development work. However, it would appear the differences in meaning between these aspects are theoretical, because in practice they cannot be applied in isolation.

The contemporary conceptualization of community development places emphasis on a further range of non material aspects to the approach. These concepts include citizen participation, consciousness-raising, self determination, cultural determination and self reliance which have emerged from changing social, economic, political and cultural conditions. These non materials concepts have been incorporated into the contemporary definition of community development.

Models of Community Development

Sanders, in discussing the inherent nature of community development, has suggested that there are four major orientations. Community development can be viewed as 1) a process, 2) a method, 3) a program and 4) a movement. [12]

Community Development as a Process

According to this interpretation, community development proceeds as a sequence of stages in the community experiencing change. It consists of a progression of changes according to specific criteria. It is a neutral, scientific term and is subject to precise definition and measurement expressed in the form of social relations. The direction of change is towards greater participation and cooperation by people in the community in decision making and community affairs. Furthermore, there is progressively greater utilization of community resources. In the process orientation, the emphasis is upon what happens to people, socially and psychologically.

Community Development as a Method

Community development has also been viewed as a method to be used in moving towards objectives. It is considered a means to an end to attain a particular goal. Method and process are in fact related terms. Community method endeavors to carry through the stages proposed under "process". The process is guided for a particular purpose depending on established criteria and the goal in view. However, in using community development as a method to attain a certain goal, process is de-emphasized as the goal appears more important. Thus, in the method orientation the emphasis is placed on some specified end.

Community Development as a Program

A community development program emerges from the combination of method, with its set of procedures, and content, with its list of activities. As the procedures are carried out, the activities are supposedly accomplished. In programs which have become highly formalized, such as five year plans, there is a tendency to focus on the program itself rather than the people for whom it was designed. It is as a program that community development comes into contact with speciality fields such as health, agriculture, welfare, industry and recreation. Those who would place emphasis on community development as a method or a process, ultimately find themselves involved in a program. It is apparent that in the program orientation, emphasis is upon accomplishing sets of activities which are measurable.

Community Development as a Movement

In this context, community development is viewed as a crusade, a cause, to which people become deeply committed. As a consequence, it is not neutral as in process, but is charged with emotional dynamics. As a philosophical concept, it is dedicated to progress in the sense that progress must be viewed with reference to varying goals and values depending on differing political and social systems.

Community development as a movement tends to become institutionalized creating its own organizational system, procedures and practictioners. From an orientation point of view, it emphasizes and promotes the idea of community development as interpreted by its disciples and has its charismatic leaders who clearly enunciate its ideology.

Although Sanders' analysis of community development indicates that a variety of different models co-exist, it also allows for a certain flexibility in the definition of community development according to particular circumstances.

> In general, those most interested in community development as a "process" work with a less detailed program, permitting each community to move ahead with its own felt needs, which may differ from those in other villages in

> the country; those who view community development as "method" tend to work with a program that has been drawn up at central headquarters and specifies the goals each village is expected to achieve in agriculture, health, or education; those who stress the "movement" introduce an evangelistic fervour that gives the program a momentum that might otherwise be lacking.[13]

Relevant to the field of community development are the three models of community organization and practice described by Rothman [14]. These three orientations relate to deliberate or purposive change in communities, both urban and rural, and overseas. Rothman's three models should not be viewed as exhaustive of possibilities, but selected for analysis because of their contemporary relevance. These models are referred to as A, B, and C or locality development, social planning and social action respectively.

> Model A, locality development, pre-supposes that community change may be pursued optimally through broad participation of a wide spectrum of people at the local community level in goal determination and action.[15]

This, in essence, is community development work which has similar themes of democratic procedures, self help, self reliance, cooperation and the development of local leadership. The model encourages people to participate in the community in the determination of community goals and actions to achieve change. In model A the role of indigenous leadership is crucial to the implementation of community goals and actions.

Model B, the social planning approach, is dependent on a technical process of problem solving in community problems.

> Rational, deliberately planned, and controlled change has a central place in this model.[16]

The emphasis in model B is concerned with the organization and delivery of goods and services to people who require them. Community involvement does not play a major role in the process.

Model C, the social action approach, places emphasis on confrontation, conflict or contest. Social action in this context, attempts to change the power structure and decision making machinery to achieve a more equitable distribution of resources and social justice. The orientation of the social action model is typified in the organizational approach and writings of Saul Alinsky [17].

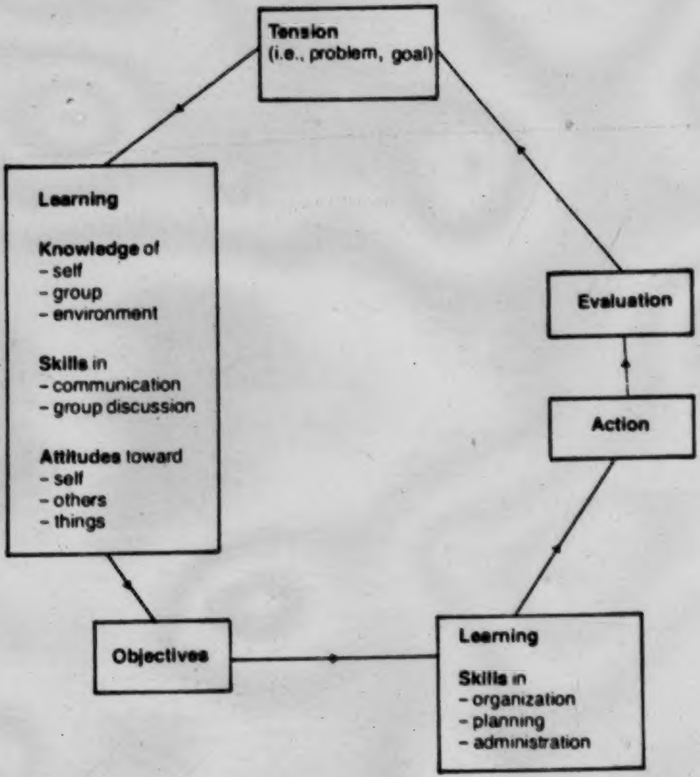
Although the models have been described as discrete types this is only for the purpose of analysis. In actual practice, however, the models overlap. Depending on the situation, a combination of the salient features of the different models may be an effective course of action. In reality, although mixtures of orientations may occur, in any given situation one model is usually predominant.

Rothman has noted the blending of models A and B in community development practice in developing countries;

> Community development as conducted overseas in developing countries also represents a composite of localized community organization along the lines of model A, together with broad social and economic planning at the national level incorporating model B.[18]

Roberts [19] has proposed a model of community development which encompasses two perspectives in that development can be viewed as both a learning and a political process. As a learning process, there is the assumption that people have the ability to perceive their needs and aspirations and adopt behaviors to change their conditions. It is a political process, whereby collective goals are sought by organizing the energies and resources within the community. This model of the community development process as outlined in figure 1 consists of a number of stages.

Figure 1. Model of the Community Development Process.



Source: H. Roberts, Community Development. Learning and Action (Toronto: University of Toronto Press. 1979) p. 36.

The initial stage begins with the perception of a need or problem by the people themselves. The process then entails learning on the part of the people of themselves as a group and of their environment, in terms of shared values and attitudes, to arrive at common objectives. As noted by Roberts:

> Community development therefore includes in its early phase a process of community creation.[20]

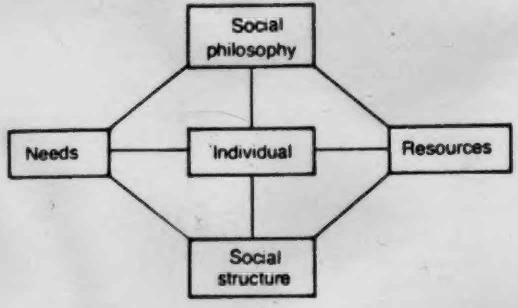
To achieve the objectives, additional learning and organization and administration is required in order for the community to take the appropriate action. An evaluation then reveals whether the objective has been achieved, and may in turn identify further tensions which initiate another cycle in the process.

Within the main stages of the proposed model of community development, Roberts indicates there are interwoven other models relating to environment, culture, group processes, organizational development, decision making and evaluation. This subset of models suggest ways of organizing actions at the various stages of the community development process.

In this model of the community development process the relationship between adult education and community development becomes apparent along the continuum which extends from learning to action and evaluation. Adult education relates to the individual perspective whereas community development can be represented as the group or community perspective. Therefore, the development of the community also involves the development of individuals, in terms of personal insight and understanding.

Of particular significance in the developing world, Roberts has also presented two models for analyzing and learning about the environment in which the community development process is to take place. Model 1, in figure 2, focuses attention on five elements to be considered in interpreting the environment.[21]

Figure 2. Elements in the Environment of Community Development.



Source: H. Roberts, Community Development. Learning and Action (Toronto: University of Toronto Press. 1979) p. 81.

The first four elements consisting of social philosophy, social structure, needs and resources are related to the social collectivity. The fifth element in the model, the individual, raises the question of the relationship of the individual with the collectivity. The model demonstrates that in community development terms, the opportunities available to members to initiate and participate in changes in society are significantly influenced by the prevailing social philosophy and social structure. Social philosophy relates to the principal political and social ideas generated by the groups in the society which exercise authority. Social structure implies the complex of existing institutions and roles, which shape the people in society. Needs, expressed or latent, are categorized as social, cultural, psychological, political, economic and educational. Resources fall under the headings of human, material and organizational resources. At the centre of this play of forces is the individual who has a need and can be a resource.

The model serves as a rational, systematic approach to analysis of the environment. The process of moving from the broad perspective of social philosophy and social structure in turn to needs and resources, clarifies possible courses of action to be taken in planning and organization. It is also apparent that needs and resources are not only elements in the environment, but also constitute elements in the population which will be involved with change. They therefore become significant factors in the planning and organization process.

Further to analysis and learning about the environment within the community development process, Roberts has described a second model with a counter-cultural perspective.[22] This model places emphasis on symbolism and inner identity of cultures with change viewed in terms of consciousness. This model differs from the previous model, which looks at the broad social and political patterns, by viewing the human condition of the people concerned in social change. By means of a process of self examination, the people identify the important characteristics of their present condition and the relationship with factors in their historic past. The building of a collective identity based on spiritual strength supported by cultural roots, can lead to clarification of the problem of their condition and suggest likely courses of actions. The methods of adult learning developed by Paolo Freire [23] would have relevance in a counter-cultural model. For Freire, the basic task of education is the need to raise a critical awareness among socially and politically deprived populations. He found learning takes place more effectively when people have the opportunity to participate actively in discussions about conditions in their villages. This in turn creates the awareness to bring about change in their own environment.

As noted by Roberts, the two models relating to environmental and cultural factors within the community development process, provide a means of mapping out the present social territory. Analysis of these factors can assist in identifying possible courses of action.

Warren's [24] approach to community development is an attempt to influence the course of change at the community level. Community development may be organized deliberately as part of a national plan, or occur separately from it to bring about desired change at the community level. In his view, it can be used as a means of promoting industrialization and of coping with its consequences. In this sense, community development can be seen as bringing about modernization, and then coping with the conditions it has created.

Warren has based his interpretation of social change on the concepts of "truth" and "love". These two concepts are used in a special sense. Truth is viewed as the conviction that exists as a fundamental moral value in calling for social change. Love is used in an appreciative sense, as the commitment to the uniqueness and value of each human being, so that human beings are to be considered as ends rather than means. These two concepts are recognized universally and honored as commitments, until they come into a conflict situation over a particular issue, and the decision of choice arises. This conflict phenomenon is apparent in the area of social change in the field of community development practice. In this instance, the concepts of "truth" and "love" represent two kinds of change process, natural and purposive, which cannot be applied simultaneously.

Warren, in distinguishing between change as a natural process and as a purposive process, has questioned;

> Can change be channeled ? Or more precisely, what is the relationship between the process of social change and the attempt to influence this process by deliberate intervention?[25]

In exploring the relationship of the truth and love concepts to purposive social change, Warren has noted the conflict situation in the dilemma between the values of the clients and those of the change agent.

> Relating truth to the specific goals that the change agent desires, but on which other people may have deep disagreements, and relating love to the contrary value that most of us acknowledge, a value that admonishes us not to impose our truth on others in these deep interest conflicts, out of respect for their value as autonomous human beings. [26]

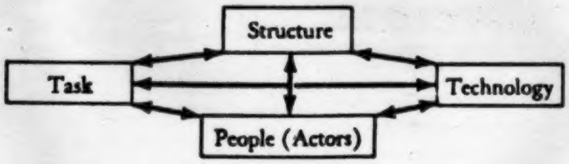
According to Warren, the dilemma cannot be resolved by consensus or compromise, but rather by a confrontation mechanism which he has termed "dynamic pluralism" . In this approach, confrontation is used creatively by channeling opposition within acceptable and tolerable limits. This mechanism may not satisfy every party to a controversy, but it will ensure that the differences and disagreements are heard.

The truth and love model has significance in the Third World in the realm of technology transfer, in terms of social changes particularly in the traditional sector. The technical specialist brought in from overseas with the goals and values of his professional subculture, is often confronted with situations of interest and value conflict. In many instances, such conflict has led to failure in development projects. The reasons given for failure and rejection of new ideas and methods have often been attributed to the conservatism and illiteracy of the population. However, studies by Freire [27] and Goulet [28], have detailed the importance of the relationship between the change agent and the target population for success in development projects. It is of vital importance that the technical specialist as a change agent has an appreciation of the underlying cultural system and values, in order to establish a meaningful dialogue for technology transfer.

Models Applicable to Technology Transfer
Within a Community Development Framework

Cultural systems are developed in such a way that it is not possible to change any part of the system without changing others. Leavitt [29], from an organizational perspective, has noted that there is a relationship between the tasks, technology, structure and the people in the system (figure 3).

Figure 3 Interacting Variables in a Complex System



Source: H.J. Leavitt, "Applied Organizational Change in Industry: Structural, Technological and Humanistic Approaches", in Handbook of Organizations. ed. by J.G. March. (Chicago: Rand McNally and Company, 1965) p. 1145.

These four variables are highly interdependent as indicated by the directional arrows, so that innovations which might be helpful in one part of the system may lead to undesirable influences in other areas.

Thus, the introduction of new technological tools may cause changes in structure, changes in people and changes in performance and even definition of task. This makes it essential for a technical specialist as a change agent to consider the possible affects of a technological change on all parts of the system before pressing for its adoption. Repercussions elsewhere in the system may be even more important and influential in the adoption and the survival of the innovation.

The Leavitt model also provides another insight for the technical specialist involved in technology transfer. If it is assumed that a relationship exists between the four variables, and that change in one part of the system will cause change in other parts, the technical specialist will have to decide on a starting point. Consideration will have to be given as to whether change can be more easily introduced into the system by suggesting change in the structure, by bringing in new modes of technology, by trying to change peoples' attitudes or by developing new tasks. Change can be commenced with any one of these aspects, but the specialist must accompany change in one area with corresponding adjustments in other areas to ensure success.

Perrow [30] has also noted the interdependency of technology, culture and structure within a systems model. The cultural system sets legitimate goals, the technology determines the means available for reaching these goals, and the social structure contains the specific techniques in such a way to permit goal achievement. The three variables therefore comprise goals (belief systems and values), technology (techniques for execution of a task) and structure (arrangement of tasks and persons). The boundaries existing between these variables are vague in the sense, that they are interdependent rather than independent or dependent. At any one time one variable may have the most power to influence the others. Perrow has addressed the interdependency aspect:

> Belief systems and values are interdependent with technology. Some values encourage a search for new techniques. Techniques can modify values by demonstrating the potentialities of the material to be transformed. Technology in turn influences structure - the arrangement necessary to implement goals.[31]

From a community development perspective, it is apparent that introduction of new technologies into a society can change belief systems, and this fact must be carefully considered in the transfer process.

Lionberger [32] has presented a model of diffusion of an innovation, incorporating an adoption process. According to this model, there are five stages in the adoption of an innovation, namely Awareness, Interest, Evaluation, Trial and Adoption.

> Awareness - the first knowledge about a new idea, product or practice;
>
> Interest - the act of seeking extensive and detailed information about the idea, to determine its possible usefulness and applicability;
>
> Evaluation - weighing and sifting the acquired information and evidence in the light of existing condition into which the practice would have to fit;
>
> Trial - the tentative trying out of the practice or idea accompanied by acquisition of information on how to do it;
>
> Adoption - the full scale integration of the practice into the ongoing operation.[33]

The five stages are not necessarily a rigid pattern which people follow, nor discrete categories with no overlap. Rather, they represent five sequences which have been clearly identified in the process.

The time factor involved between initial information and final adoption varies considerably by person, place and practice. There appears to be selective factors relating to acceptance of a new innovation. Practices compatible with existing ideas and beliefs are more likely to be adopted rapidly. Social groups and cliques influence adoption patterns, with personal influence a deciding factor in the early stages. Group processes, such as group discussion techniques, can effectively advance adoption of an innovation. Information sources and mass media can serve as change agents in the diffusion of new innovations. Lionberger refers to "special functionaries in diffusion" in a community, who may be innovators or key communicators such as local or opinion leaders. Culture can be an important conditioning factor in accepting changes in the adoption of new practices. The significance of the model for technology transfer is the role given to mass media methods such as films, followed up by group discussion and the education of leaders who will be able to influence others in the diffusion process.

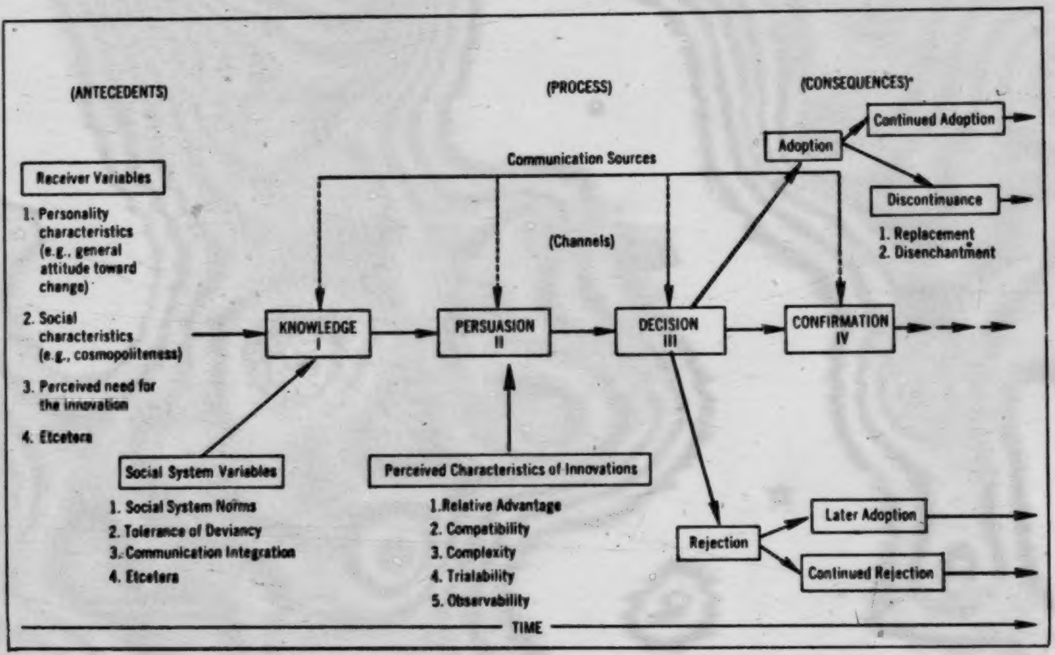
Although this model has been favored by diffusion researchers in the past, critics of the model have suggested that it is too simple. A number of deficiencies in the model have been identified. The model implies that the process always ends in adoption decisions, whereas in reality, rejection may also be an outcome. The five stages do not always occur in order, and in fact some stages may be skipped entirely, particularly the trial stage. Evaluation usually occurs throughtout the process, rather than as one of the five stages. The process seldom ends with adoption, as further information seeking may occur to justify the decision, or the individual may switch from adoption to rejection.[32]

Rogers, has designed a model of the innovation-decision process to account for the major criticisms raised about the previous five stage adoption process model. This conceptualization consists of four sequential functions or stages:

1. Knowledge - the individual is exposed to the innovation's existence and gains some understanding of how it functions.
2. Persuasion - the individual forms a favorable or unfavorable attitude towards the innovation.
3. Decision - the individual engages in activities which lead to a choice to adopt or reject the innovation.
4. Confirmation - the individual seeks reinforcement for the innovation-decision he has made, but he may reverse his previous decision if exposed to conflicting messages about the innovation.[35]

The model (figure 4) emphasizes the importance of antecedents, which are the variables present in the situation prior to the introduction of the innovation. These antecedents include personality characteristics, social characteristics and perceived need for the innovation. All these variables affect the innovation-decision process for a given individual. Furthermore, the social system's norms serve as restraints or incentives on the individual's decisions on the process. Communication sources and channels can provide input throughout the entire innovation-decision process. At the persuasion stage, perceptions of the innovation are obtained through more local and interpersonal channels.

Figure 4 Paradigm of the Innovation-Decision Process



Source: E.M. Rogers with F.F. Shoemaker, Communication of Innovations. A cross-cultural approach. (2nd ed,; New York: The Free Press, 1971) p. 102.

Rogers has observed the model's stages may occur in a different order, or in a different way for some individuals and some innovations. It would appear the model best fits the situation of optional decisions and would need to be modified to be appropriate for collective or authority decisions. Theories of learning, decision making and attitude change have been blended into this revised conceptualization of the innovation-decision process. Relevance of the model to diffusion of appropriate health care technology highlights the importance of knowledge and an understanding of the cultural system in which the transfer process is to take place. Moreover, the model provides a theoretical framework to guide the transfer process with an understanding of the many factors which affect the diffusion of innovations.

The Primary Health Care Model

If the World Health Organization target "health for all by the year 2000" is to be reached, health services are required which are based on technology and methods that can be understood, accepted and applied by the non expert. Health development can be seen as an entry point to general development. Planning for better health care however must involve other aspects of socioeconomic life such as education, welfare and agriculture with maximum community participation in the decision making process.

The primary health care model has been proposed as a means to achieve an equitable distribution of health care resources in developing countries. As noted by the World Health Organization:

> Primary health care is defined as essential health care made universally accessible to all individuals in a community through full participation of its members, by means that are acceptable to them and at a cost the community and country can avoid. It forms an integral part both of the country's health system, of which it is a vital component, and of the overall social and economic development of the community."[36]

The formulation of policies for planning and implementation of primary health care requires intersectoral coordination at the national level to insure integration of primary health care with all other sectors of the local community. Of necessity, primary health care should reflect the sociocultural values, economic conditions and health needs of the society in which it functions. Therefore, the primary health care concept requires that health related activities be shaped and carried out in conformity with the life pattern, needs, priorities and capabilities of each community.

Beyond trying to make the best possible use of scarce local resources, it seeks to change the community's view of the health care system. Grass roots participation in health activities is emphasized, in that primary health care workers should be selected by the community from within the community. Thus, the delivery of health care should be organized so that it belongs to those it is designed to serve. It is evident that popular participation in health related activities is the essence of the primary health care model in health services.

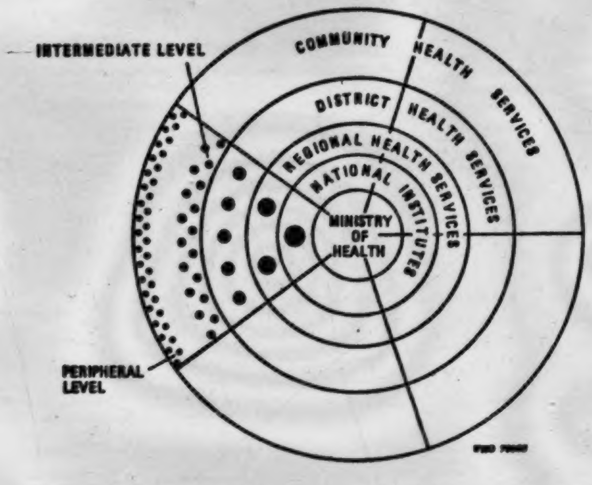
The primary health care model used in developing countries would appear to relate to Rothman's models A and B of community organization and practice.[37] Model A - locality development would be predominant with overlap from model B - social planning. From the model A perspective, primary health care to be effective can only be achieved through active community participation at the village level. Model B is represented in recognizing the Ministry of Health is responsible for national health policy within overall socioeconomic development. Central planning is required to ensure the correct delegation of responsibility, proper allocation of resources and technologies, and linkage to other levels in the health care system. It is also necessary for central planning to provide guidance to communities in developing and operating their primary health care programs.

The primary health care model embodies the community development approach in that it possesses similar principles. The emphasis is upon communities with some guidance utilizing their own resources to organize themselves to achieve objectives they have set. The creation of a village health committee is a way of achieving community participation, thus allowing rural people to understand through actual experience, the problems that can be solved by their own resources. By working with health personnel, its members can identify and analyze problems, establish priorities and draw up plans of action for implementation. Health personnel with the support of the committee, can create and utilize health care facilities in ways which are acceptable to the community, and which will meet their health care needs.

To heighten community awareness of health matters, health personnel should be educators in initiating and stimulating community participation in both individual and community health care. Focus is on the promotion of self reliance at the local level in health care matters. Political commitment at the national level is a prerequisite for a successful primary health care policy. This committment should be expressed through the allocation of adequate resources, so there is a more equitable per capita distribution of health expenditures between rural and urban areas. A UNICEF/WHO study [38] has described examples of strong community support with decentralized management within the framework of unified national programs in the People's Republic of China, Cuba, Tanzania and Yugoslavia.

Central to the primary health care model, is that health services must benefit the entire population (figure 5).

Figure 5 Coverage of Health Services

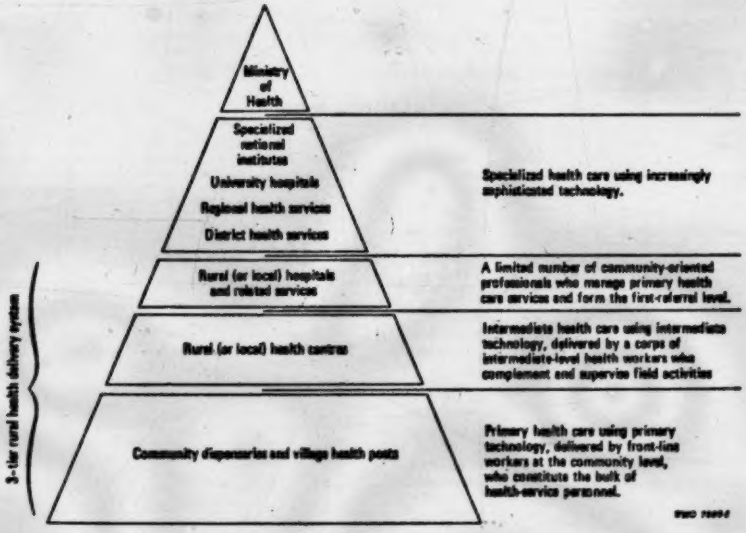


Source: WHO Training and Utilization of Auxiliary Personnel for Rural Health Teams in Developing Countries. Technical Report Series 633 (Geneva: World Health Organization, 1979) p. 10.

The figure shows the organization and coverage of health care institutions in a country on the basis of the primary health care concept. The dots in a section of the circle represent health care institutions in one region of the country.

The rational way of organizing primary health care is within a three tiered delivery system, which is illustrated in the classical pyramid of health services. (Figure 6) Each tier of the health delivery system should function in a working relationship with the others. For this to be effective, health personnel need to be familiar with good management practices.

Figure 6 Pyramid of Health Services


Ministry of Health
Specialized national institutes
University hospitals
Regional health services
District health services
Specialized health care using increasingly sophisticated technology.
Rural (or local) hospitals and related services
A limited number of community-oriented professionals who manage primary health care services and form the first-referral level.
Rural (or local) health centres
Intermediate health care using intermediate technology, delivered by a corps of intermediate-level health workers who complement and supervise field activities
Community dispensaries and village health posts
Primary health care using primary technology, delivered by front-line workers at the community level, who constitute the bulk of health-service personnel.
3-tier rural health delivery system

Source: WHO Training and Utilization of Auxiliary Personnel for Rural Health Teams in Developing Countries. Technical Report Series 633 (Geneva: World Health Organization, 1979) p. 11.

It is apparent the themes of the primary health care model are the same themes reflected within the community development model which involves setting priorities by external change agents in conjunction with people in the local community towards the ultimate goal of integrating the community into national life. To accomplish appropriate health care technology transfer from a community development perspective, it is clear that the primary health care model is the logical choice in which this should occur. Furthermore, integral to a primary health care model, is the use of technologies which are appropriate, effective and acceptable to the community.

As defined in a WHO technical report:

> "Appropriate" technology means technology, that is not only technologically sound, but also acceptable to users, providers and decision makers alike. It is technology that is simple in design and execution, fits with local cultures, and can be adapted and further developed locally at low cost.[39]

Examples of appropriate technology for primary health care can be the use of bamboo for crutches: the household treatment of diarrhoea by oral rehydration: and the use of coconut fiber for water filtration.

Although most developing countries have enunciated plans and policies for primary health care, except for a few notable exceptions, health services for rural populations have not improved significantly. Similarly, multinational organizations, technical assistance agencies and private voluntary organizations engaged in primary health care lack action strategies. This results in fragmented projects which are often unrelated to national programs, and of little long term significance. It is clear any problems that beset primary health care will in turn impede successful transfer of appropriate health technology.

A review of the literature relating to primary health care has disclosed many of the major problems in manpower and systems development which may be considered generic. Recent studies of primary health programs, which can equally apply to broader community development efforts, point particularly to many obstacles in the way of cooperative community action for self help, in terms of the participatory process. One basic problem is that group cohesion and similarity of interests and perception necessary for a group of people to form a community are not universal phenomena. Rural areas in developing countries are characterized by an uneven access to productive resources; the prevalence of traditional patterns of social stratification and separation based on caste, ethnicity, religion and sex; and the reinforcement of the existing structure of privileges by political and economic institutions and practices. Even the introduction of community selected health workers may prove to be a threat in the existing village power structure, in terms of change which involves the democratic participation of all of the village people. Ahmed has addressed this issue:

> The unhappy reality in many developing countries is that unless the structure of privileges and highly unequal

> social and economic relationships among the people are swept away by prior change in the national political structure, the creation of a community spirit, the articulation of community aspirations, and the people's participation in the planning and management of community programs can progress only falteringly and in limited ways.[40]

Smith[41] has noted that a high level national commitment is necessary, otherwise primary health care programs will flounder. However, even if the principles and objectives in primary health care are accepted in national policies and goals, traditions and attitudes prevailing in the government machinery often prevent their translation into concrete action. Ahmed[42] and Habicht[43] have drawn attention to the perpetuation of traditional organizational structures, and the unwillingness to decentralize the administrative machinery and entrust responsibility and accountability to the local communities. This traditional pattern is again reinforced by the stratified social structure that separates the rural masses and the educated, urban, and privileged people, who run the government system, including health services.

The primary health care approach can also be undermined if nominal adoption of a primary health care strategy leads to a dichotomy of health services with "self help" for rural people, and the provision of hospitals and medical specialists for urban people. A primary health care program becomes easily discredited, if sufficient resources are not channeled to support community level activities in terms of training, supervision, supplies and an efficient referral system.

Another obstacle cited is the situation where there is no tradition of community involvement in development efforts, and adequate local government structures and local organizations do not exist. It then becomes a slow and difficult process to develop the mechanisms and motivation for community participation in health care. This dilemma can usually be traced back to a national political system, which does not encourage decentralization of responsibilities, and does not provide a climate for community participation in local development.

Smith [44] has addressed the issue of a fragmented approach to health sector development. All too often the purposes and resources of donor and international agencies can influence decision making. There appears to be a bias towards pilot projects for development purposes, because they fit into specific time frames of project management and offer quick results. Furthermore, such projects can often not be expanded or replicated. A government will often agree to such donor promoted projects without due consideration to their long term implications. Feuerstein [45] has noted that the activities of religious and philanthropic organizations can add further fragmentation to national health development. These activities often take place in isolation, and consequently, overlap, duplication and conflict have occurred.

In the past, ineffective and inefficient training of health workers has occurred within primary health care programs. Smith [46] has observed that too much time is spent on academic rather than the practical aspects of training. Few training programs and training publications are concerned with knowledge transfer and skills development on how to do the job. Frequently, training occurs away from the worker's home and work place influencing selection, and reinforcing the emigration aspect from rural areas. Furthermore, if adequate supervision and continuing education are not incorporated into primary health care programs, skills tend to deteriorate and new skills are not acquired.

Failures in primary health care have occurred where there has not been an appreciation of the sociocultural context in which health activities are to take place. Lack of cultural understanding has taken its toll in terms of effectiveness of programs. Health personnel have not been aware of the health beliefs and practices in a community, the reasons for their existence and the linkage to customs. This seems to be due to a basic lack of communication between health workers and the population in the community. As Matthews noted:

> This lack of communication arises because of considerable differences in sociocultural background between patients and health workers. Also, expectations of both patients and health workers may be unrealistic leading to disappointment and frustration, which further increases the lack of understanding between the two groups and their lack of confidence in each other. As health workers, we cannot expect the patients to immediately understand our ideas and, in order to bridge the gap, we must first understand their beliefs and concepts. Their situation is not so much ignorance or lack of knowledge, as a different set of beliefs and concepts.[47]

Similarly, there appears to be a lack of appreciation of the fact that communities in developing countries have distinct, valued and time tested beliefs and practices related to health and disease.

Traditional medicine has long played a significant role in developing countries, and indigenous healers have been held in high esteem in their communities. Undoubtedly, some practices are harmful, some harmless and some beneficial. However, the possibility of combination of traditional medicine with modern medicine appears to have been inadequately explored to date.

It becomes apparent that if appropriate health technology transfer is to take place within a primary health care framework, the shortcomings existing in the present primary health care model must be remedied. There is a need to redefine the community perspective within primary health care to effect a more comprehensive community development approach to facilitate appropriate health technology transfer.

Footnotes

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CHAPTER V

A COMMUNITY DEVELOPMENT MODEL FOR APPROPRIATE HEALTH TECHNOLOGY TRANSFER

Introduction

The primary health care concept has been developed as a means to achieve a more equitable distribution of health resources in developing countries. To meet the basic health needs of these populations careful planning is necessary to ensure accessibility to the health care system. In this chapter the author will describe a model for appropriate health technology transfer which takes into account a national commitment to a primary health care philosophy. This implies that an umbrella philosophy of primary health care needs to be in place in order for appropriate health technology transfer to be accomplished effectively. This chapter thus addresses itself to the ways and means to achieve this goal.

A review of the literature has identified a number of shortcomings in the primary health care experiences of developing countries. These include lack of a national commitment and the necessary government machinery to achieve a wide health coverage of the population. This coverage is often hindered by the entrenchment of the existing structure of privileges by political and economic institutions. Furthermore, involvement of donor and/or international agencies has led frequently to a fragmented approach to health services development. There has been a concentration of health resources and services in urban areas, leaving the rural areas ill-served. Lack of understanding of the socio-cultural context and poor integration of traditional medicine has created obstacles to community action and participation. Ineffective training, poor supervision and lack of on the job training and education for health personnel have further hampered development of primary health care in developing countries.

If primary health care is to provide the environment in which appropriate health technology transfer is to take place, the deficiencies in the system must be remedied. Smith[1] has outlined a set of principles, which can be used to develop effective strategies for primary health care. These principles have been drawn from the primary health care experiences of a number of developing countries discussed at regular meetings by personnel engaged in the field. A national commitment and philosophy has been noted to be essential for the development of a broad base of support for a primary health care system to ensure mobilization of resources and coordination within and between sectors. A political mandate of this nature will increase the potential for successful implemention. Country-specific goals and objectives should be established in terms of population coverage, health indices and other relevant characteristics. The choice of health interventions is inevitably determined by particular local needs, level of development and cultural factors affecting acceptability. A systems approach to rationalize the delivery system would integrate new primary health care activities into the existing health institutional structure, reduce redundancies in structure and function, and improve relationships between ministries in related development spheres. The ministry of health needs to incorporate a planning and evaluation system in its strategy to support primary health care. This would allow formulation of long-term and short-term plans in concert with other ministries, such as economic planning and finance. A manpower infrastructure should be developed for the training and deployment of competent health workers for each level of the health care system. A manpower tier, where each level in the system supervises a subsequent level, would link highly trained professionals at the centre with health workers at the periphery. A tiered structure would establish a base for a sound referral system, and ensure continuous delivery of health services, as well as specialized services when necessary. The need to balance central and community inputs into primary health care, requires a mid-level health worker as a "connector" to reduce the gap between the health centre and the periphery. The mid-level health worker can assist the process by merging development strategies from the central and peripheral parts of the system. By assisting villagers to mobilize for primary health care and selecting community health workers, the mid-level worker can reduce many of the problems encountered through isolation of community health workers.

Training methods and on-going continuing education need to be examined to draw on the most appropriate approaches for the setting. Competency-based training, which draws on new content from selected texts adapted for local settings, is preferred over traditional teaching methods with standard texts. The competency-based educational process has the advantage of involving local personnel in curriculum development, as well as learning to teach in the system. The methods chosen for the transfer of knowledge and skills to illiterate or semiliterate community workers will vary from those used with literate workers. Local languages and dialects where possible should be used in these methods. The aural/oral approach has been found to be effective with low literacy levels, thus drawing on a greater reservoir of personnel at the community level.[2] Continuing education should be built into the action strategy from the beginning, and integrated with supervision, to upgrade job performance and to prevent deterioration of skills and knowledge. Continuing education with the potential for upgrading also provides support to the peripheral health worker.

Uniting these principles into an action strategy can provide a country with a policy to direct the appropriate allocation of its resources, and for obtaining external resources. Coordination of external inputs from technical assistance and internal agencies can strengthen and foster primary health care programs. However as Habicht[3] has observed, commitments to the objectives of primary health care must be compatible among donor agencies and the health authorities in a particular country. A health organization can have different implicit objectives, often contra-indicatory, which may be apparent in the workings of the organization, but not in its official declarations.

An appreciation of the socio-cultural context in which primary health care activities take place is considered essential. Introduction of new health habits cannot be merely added to an existing pattern or old habits simply subtracted. The culture has to be understood in terms of its relationship to health practices.

Similarly, traditional medicine has been an established part of culture in developing countries and is still practised in many of these cultures. Feuerstein[4] has noted that some systems of traditional medicine are well developed as in China where the system is practised, alongside Western medicine. The Ayurvedic system in India is also practiced alongside the Western system of medicine. Bannerman[5] has described traditional medicine as a vague term which encompasses ancient and culture-bound health care practices that existed before the application of science to health matters. Traditional societies have long regarded health as a state of balance or equilibrium of forces, both internal and external.

An important but much neglected aspect of local community health concerns traditional healers and midwives. Traditional healers play an important role in their communities in regard to common ailments and mental disorders. Many observers have been impressed with the personal style of traditional healers in terms of their dress, their calm and authoritative air and general approach to treatment.

Fendall[6] has observed that a combination of traditional medicine and modern medicine appears to be a promising and appropriate solution for health care problems in developing countries.

> Modern medicine originally stemmed from traditional medicine, and every country has always had its own indigenous healers who still have some non-utilized potential. Their continued persistence affirms their community value. Greater progress could be made if different systems of health care would increase their efforts to coordinate and even integrate their policies.[7]

If participation by the community in primary health care is to be effective, it would appear traditional practioners cannot be excluded. Similarly, traditional midwives well respected within their communities, can be trained in safe and hygienic midwifery practices and added to the cadre of primary health care personnel. Several Third World countries now have considerable experience in the design and implementation of training programs for traditional midwives.[8]

Community participation in health related activities is the essence of the primary health care approach. Ahmed[9] has identified key elements of a strategy for community participation in primary health care. One essential step is the reorientation of the health service structure and personnel to the role of primary health care, in particular, instilling in health service personnel, the attitudes and perspectives in conformity with the principles of community participation. This change in outlook can be brought about by health personnel engaging in a process of self appraisal and self-education by small health teams going out to representative regional rural areas to investigate the health status and resources of the people first hand. The results of investigation and appraisal can be used not only to formulate a plan of action for reform of the system, but also provides a means of re-education of health personnel. A further step following the national appraisal would be an in-depth diagnostic exercise of particular localities to identify pertinent factors which would affect community participation. This assessment would include a study of the health status and needs, resources and constraints within the community. Local people should be extensively involved in this process through formal and informal dialogue and discussions. This team exercise should provide the basis for responding to the variations in circumstances of local communities within the framework of national objectives. Additional steps suggested by Ahmed include devising and improving modes and mechanisms of participation and educational processes within the community. The methods of Friere[10], "conscientizing" the community, by creating a critical awareness among the people of the roots of their problems and approaches for tackling them, could be considered in this framework.

Another facet of a comprehensive primary health care program, is that health and other objectives must be translated into activities with measurable goals. The need for measurable indicators has been acknowledged, but less attention has been paid to setting measurable goals. Establishment of such goals requires information on current deficits in health indicators coupled with knowledge on how the deficits can be corrected through primary health care's appropriate mix of interventions and technologies. Habicht has addressed this issue:

> The mix of interventions must represent a trade-off between acceptability and efficacy if a program is to be effective. What is efficient to achieve equity may not be efficient to achieve health. [11]

The initial phase is to identify an effective mix and adapt it to the local conditions. The appropriate mix of interventions must also be matched to the personnel who will perform the services.

In reviewing the literature, it would appear the process involved in the design of primary health care systems can be extrapolated from one situation to another, but the precise structure and appropriate mix of interventions and technologies required cannot be readily transferred without adaption.

In this concluding chapter the way to achieve the goal of appropriate health technology transfer within a primary health care framework will be explained relative to a number of stages in the process. The author has developed a model encompassing six stages in the process of appropriate health technology transfer from a community development perspective.

A Community Development Model for Appropriate Health Technology Transfer

The conceptualization of the model consists of six distinguishable stages:

Stage 1 - Identification of Health Needs

Stage 2 - Selection of Health Technology - To Match Identified Need

Stage 3 - Introduction of Technology - Training and Preparation of Health Personnel

Stage 4 - Transfer process - Preparation of the People in the Community for the Technology

Stage 5 - Implementation - On a Field Trial Basis

Stage 6 - Evaluation of Results

These stages will now be described in detail.

Stage 1 - Identification of Health Needs

In developing an approach to appropriate health technology transfer, it is necessary to determine the country's health care priorities by obtaining relevant health data. In developing countries, country wide demographic epidemiological data may not exist due to the nature of the terrain, isolation of rural populations, illiteracy and poor communication. Where data are available, they are frequently unreliable. [12] Besides data obtained from government publications and hospital sources, it may be necessary to collect information from non-government sources, such as out post stations, missionaries in the field and village headmen.

The categories of health related statistics are:

a) demographic data: these include the number of people and their attributes i.e.: age, sex, ethnic origin, urbanization, geographic distribution and other similar characteristics. Attempts to obtain this information is usually by census and registration.

b) vital statistics: these include live births, deaths (including fetal deaths) by age, sex and cause; marriages and divorces; migration (internal and external to the country) and other related categories. Such vital events such as births, still births, abortions, marriages and deaths are prone to error, because of cultural and religious attitudes and traditions towards health and disease.

c) health statistics: morbidity/mortality data by type, severity and outcome of illness or accident; data on communicable diseases and patterns of illness in the population. The collection of data regarding morbidity and disease is recognized to be subject to error through under reporting and misclassification. The value of routine health data collection is questionable in developing countries. Planned, periodic sample surveys will supply more useful information at lower cost.[13]

d) statistics required for health care planning: key data on existing numbers, types and distribution of services and personnel in urban and rural areas are necessary pre-requisites. Information should also be acquired on the status of indigenous healers and midwives as a possible core of health personnel at the village level. The policy of government regarding the health of its people can often be determined by the percentage of G.N.P. devoted to health.[14] Gaps in service, facilities, health care personnel and organization infrastructure can often be identified by perusal of government documents. The collection of health related statistics is an activity that requires planning, financing and evaluation. A strategy is required to make sound policy decisions on data which is not too sketchy or costly.[15] Repeated sampling surveys can be used to monitor activities regarding program effectiveness.

Health care management in most developing countries has been noted to suffer from an "information gap", in that the information available is often unreliable and inadequate in scope. Resources devoted to collecting and interpreting information need to be in proportion to expected benefits.

Pacey[16] has indicated that to obtain information for health development it is not always necessary to undertake costly surveys. A rapid reconnaissance can provide a "sounding" of the local situation and allow projects to be commenced that will automatically generate data as they proceed. Pacey has outlined a format of cost effective techniques, which can be used in taking soundings for health development, and this is presented in summary form in figure 7. Of particular note from a community development perspective, is the emphasis given to the important categories of "observation" and "listening and asking". The most important information about rural situations is obtained by observation, listening and talking to local people.

Figure 7 Summary of Cost-Effective Techniques used in Taking Soundings for Rural Development

Sampling	- methods of countering bias: informal transects, local enquiries, - quota sampling and cluster sampling
Use of existing data	- reports, statistics, maps, air photographs, - health data and service statistics - indicators based on recorded data - local or indigenous technical knowledge
Field methods observation	- techniques of observation: unhurried looking, use of notebook, checklists - adaptations of participant observation - indicators based on observation
listening and asking	- guided interviews and the sondeo method - interviews with key informants - group interviews - cross-generation discussions
lay reporting	- simple community surveys - lay reporting on disease
complementary methods	- aerial reconnaissance - laboratory tests
Presentation of Results	- cross-checking evidence - scenarios, systems perspectives, and case studies - sondeo reports

Source: A. Pacey, "Taking Soundings for Health and Development", World Health Forum. III, No 1 (1982), 39.

Pacey has observed:

> Observation yields two kinds of information: firstly direct evidence of living conditions, environmental hygiene, and so on, and secondly clues and symptoms, some of them definite enough to be used as indicators of underlying problems.[17]

The guided interview is a widespread technique utilizing a checklist agenda of subjects to be covered. The use of the local dialect, through an interpreter if necessary, in conjunction with a natural setting for the informants, can provide an important source of information.

Pacey has referred to the sondeo or "sounding" method used in Guatemala as an effective survey tool. This consists of pairs of interviewers working together, with one member of the pair represented by an agricultural scientist, and the other a social scientist or economist. Questionnaires or fixed guidelines are not prepared, because the combination of disciplines of the interviewers provides its own agenda. In the evening following a day of interviewing, several pairs of field workers meet to exchange ideas and write up notes. This method has produced a report in six to ten days covering a region of 100 square km.[18] The effectiveness of the method has been due to the homogeneity of the agricultural area surveyed. It is suggested that this method could be used in health surveys in areas with a homogeneity in health problems. An important aspect in sondeo surveys is that interviews are conducted in a dialogue form rather than as an interrogation.

Key informants can be selected for interview when data collection is needed rapidly. There is an obvious danger in the bias which enters through personal contact, because key informants are often better educated or occupy a strategic position in the community. This bias can be offset, however, if the key informant, for instance a school teacher, can provide an independent view. School teachers can also provide useful information about children, their families and the community in general.

Group interviews and meetings can provide opportunities to gain insights into rural health problems. "Cross generational" discussions held with a group of people of different ages can provide a historical account of the health situation. Emphasis on participation by the community provides a means of tapping local knowledge and improving cost effectiveness. Local people can be involved in long term data collection, such as lay reporting of disease patterns, births and deaths in the community. The formation of a village health committee can be used to coordinate activities in lay reporting. The case study approach leads to the writing of reports which are descriptive, rather than statistical. This can be an advantage because it provides a view of the total situation with a practical orientation.

One of the limitations of rapid, cost effective, broad in scope surveys is that they use fragmentary evidence and can be influenced by on-site situations observed during the survey period. Professional researchers who value accuracy no doubt will find the information obtained by taking soundings to be imprecise. However, as Pacey has noted this same format is used by physicians, policemen and historians, who must develop skills in assemblying widely scattered information into a coherent pattern.[19]

Data should only have such accuracy as is relevant to decision making. Therefore these methods could provide useful insights for health project formulation particularly at the local level, where practical action and innovation is planned. The use of cost effective surveys draws on a great diversity of people including management personnel, health workers and lay people. As Pacey has commented:

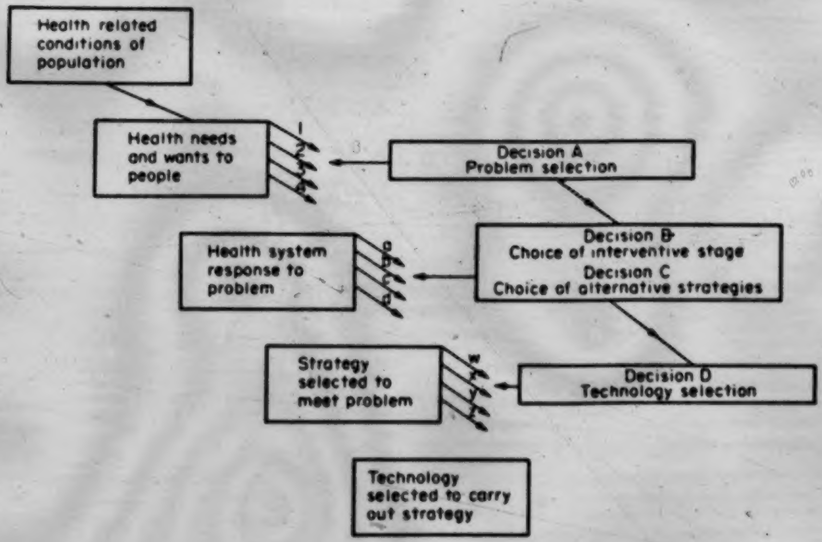
> The greatest advantage of soundings might perhaps be the many opportunities offered to the community for actively participating in data gathering for health planning and management.[20]

Stage 2: Selection of Health Technology - To Match Identified Need

Analysis of the data collected should reveal the country's major health problems, so enabling priorities to be established regarding health care policies and programs. The Ministery of Health is responsible for developing a national health policy. This policy should ensure the correct delegation of responsibility, proper allocation of resources and attendant technologies, linkage to other levels in the health care system, and accessibility at the community level.

Among the many health needs identified, certain problems will be selected for priority attention requiring the development of the necessary health services. Effective strategies are known for many of the health problems occurring in developing countries. Certain strategies can be applied directly without change, whereas others may need modification to suit the particular local circumstances. In any health problem a certain strategy will need to be selected to ensure a satisfactory outcome. In following this strategy the appropriate set of actions, namely the health technology, will need to be chosen. Parker [21] has outlined the sequence of events leading to selection of any particular health technology, as shown in figure 8.

Figure 8
The Sequence of Health Technology Selection


Health related conditions of population
Health needs and wants to people
1
Decision A Problem selection
Health system response to problem
Decision B Choice of interventive stage
Decision C Choice of alternative strategies
Strategy selected to meet problem
w
Decision D Technology selection
Technology selected to carry out strategy

Source: A. Parker, "Health Technology and Primary Health Care," Social Science and Medicine, XII, (1978), 32.

The process of health technology selection consists of key decision points A. B. C. D. The steps in this process can be used at different levels in the health system and by different categories of personnel.

Decision Point A - Problem Selection

Selection of the health/disease problem for specific attention will be dependent on the resources available. Political and vested interests can exercise influence at this decision point. However, if rationally derived choices are based on sound data, these should increase the likelihood of adoption by the health system to meet population needs.

The significant factor in decision A is whether the problem can be solved by technology presently available, and within the limited economic resources.

It can be seen that decision point A plays an indirect role in the final selection of health technology, as the developing country must ultimately decide which problems the primary level of care can concentrate its efforts. By narrowing the field of concentration, the appropriate technologies and their associated training programs can be developed and implemented with greater economy.

Decision Point B - Choice of Interventive Stage

Each health/disease problem has different stages at which effective interventive can be taken. Usually, one stage can be selected as the ideal point for intervention. As a rule, this will be as early in the progression of disease as possible, where cost to the system and harm to the patient are minimized. To arrive at the correct choice of interventive stage, each stage needs to be examined in terms of its technological feasibility.

Factors to be taken into account include the comparative effectiveness, safety, cost, feasibility, acceptability and degree of technical complexity. In addition, the level of the health system required to carry out the intervention stage in terms of facilities and personnel, must be considered. If facilities and personnel are not available, the question of their development must be pursued. Decision making therefore requires input from the national level regarding effectiveness based on data available, and also from the service level concerning acceptibility and feasibility of delivery. Again, at decision point B, political decisions may override technological decisions. Decisions at this point in the process can be seen to be a further narrowing of choice, concentrating on a limited set of interventions.

Decision Point C - Choice of Alternative Strategies

When the decision on an interventive stage has been made, the next step will be choice from the alternative interventions. The majority of problems will have several interventions by which the objective can be achieved. Parker has noted that little information is available regarding many problems seen at the primary level in developing countries on which to compare alternative strategies. Relatively few clinical and research trials of a curative or preventive nature, have been carried out to date.[22] Until such time that a firm research base has been developed, emphasis must be placed on collecting information on acceptibility and feasibility factors from people working at the community level, as well as the community itself. The use of soundings achieved through cost effective techniques, as outlined previously, would be valuable on acceptability and feasibility factors.

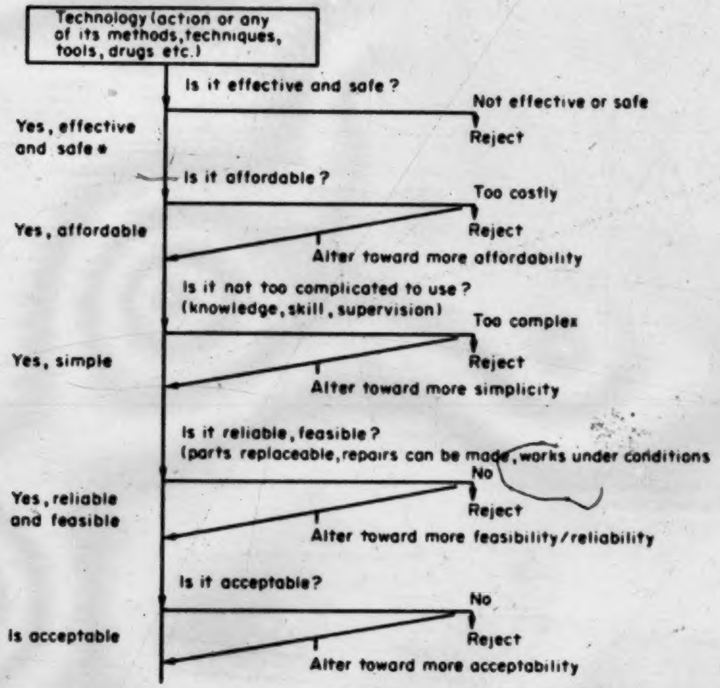
Decision Point D - Technology selection.

Once a strategy has been chosen, a decision must be made on its implementation, in terms of the combination of methods, drugs or techniques to be used. Examination of alternatives to arrive at an appropriate technology must be based on effectiveness, cost, safety, acceptability, feasibility and degree of complexity. It is this choice of technology which will establish the pattern of care at the service level.

In terms of choice, a country may develop its own technology, draw on an available technology to suit its needs, or modify an existing technology to fit in with local conditions. In devising its own technology, a developing country by a process of self-help, can draw on community resources and skills. Abundant labor resources and skills in handling materials such as stone, wood, pottery and weaving can be utilized in the construction of equipment required for appropriate technology. In terms of modification of an existing technology for local needs, Parker has outlined a path that can be used in the decision making process, as shown in figure 9[23].

Although a simplified conceptualization, the modification path includes questions relating to key factors that are required at each phase of the decision making.

Figure 9
Health Technology Modification Process


Technology (action or any of its methods, techniques, tools, drugs etc.)
Is it effective and safe ?
Not effective or safe
Reject
Yes, effective and safe *
Is it affordable ?
Too costly
Reject
Yes, affordable
Alter toward more affordability
Is it not too complicated to use ? (knowledge, skill, supervision)
Too complex
Reject
Yes, simple
Alter toward more simplicity
Is it reliable, feasible ? (parts replaceable, repairs can be made, works under conditions
No
Reject
Yes, reliable and feasible
Alter toward more feasibility/reliability
Is it acceptable?
No
Reject
Is acceptable
Alter toward more acceptability

*This will represent a range of effectiveness and safety

Source: A. Parker, "Health Technology and Primary Health Care," Social Science and Medicine, XII, (978), 34.

The factors to be considered are effectiveness, safety, affordability, degree of complexity, reliability, feasibility and acceptability. Modification in the final analysis will be a balance in all these factors involving a composite of social judgements and scientific fact.

Stage 3 - Introduction of Technology - Training and Preparation of Health Personnel

The process commenced with an analysis of the situation, identification of the major health needs of the people and selection of the strategies and appropriate technologies to meet these needs. This sequence gradually builds a picture of the health personnel required to provide the best service delivery at the lowest possible cost and at the desired compromise between quantity and quality. The analysis of the situation and selection of priorities relative to the available resources, result in a description of the work to be accomplished. The training objectives for health personnel must be defined according to the knowledge, skills and attitudes required for the particular tasks. The curricula would be developed on the basis of these objectives. The development, implementation and coordination of training programs for the variety of health personnel required therefore need to be correlated with national policies regarding health priorities, strategy selections and appropriate health technologies. To promote use at the peripheral level of low cost, simple technologies the country will need to assist local health personnel through demonstration projects and rotation of staff through model units. The Ministry of Health may wish to introduce the particular strategy and attendant technologies on a field trial basis prior to full scale implementation. In this way problems can be ironed out with minimal disruption to the total health care system.

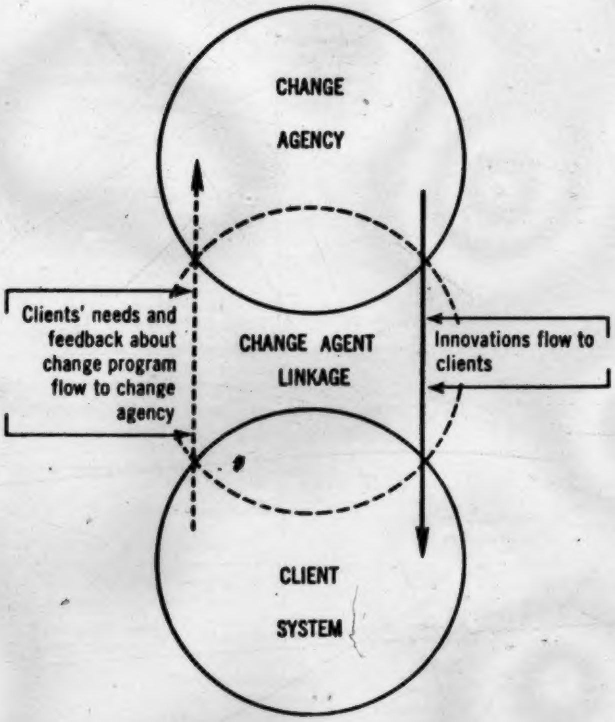
The country itself could likely serve as the diffusion point for knowledge and appropriate technologies developed outside the country. Consideration should be given to using well prepared nationals as change agents in the diffusion of appropriate health technologies. Knowledge of the local culture and language would facilitate the transfer process, and thus eliminate many of the problems encountered by the "foreign expert". This would depend on the level of development in the country, but could be the ultimate goal to strive towards in health diffusion strategies.

The technical consultant from outside the country responsible for the diffusion process, must have a sensitive appreciation of his role as a change agent in another culture. The change agent can be seen to function as a communication link between two social systems as represented in figure 10. Rogers[24] has noted there is often a social chasm existing between such systems. Typical disparities between systems include language differences, socio-economic status, educational differences, technical competence, beliefs and attitudes. The gap existing between the systems may create role conflict and problems in communication. As Rogers observed:

> As a bridge between two differing systems, the change agent is necessarily a marginal man with one foot in each of two worlds. His success in linking the change agency with his client system lies at the heart of the process of planned change.[25]

Change agent success appears to be related to a number of factors. These include the extent of change agent effort, empathy, and credibility with clients; compatibility of the program with client's needs; client orientation rather than change agency orientation; similarity of interests and meanings; and finally the ability to work through opinion leaders.[26]

Figure 10 Change Agents Provide Linkage Between a Change Agency and a Client System


CHANGE
AGENCY
Clients' needs and feedback about change program flow to change agency
CHANGE AGENT LINKAGE
Innovations flow to clients
CLIENT
SYSTEM

Source: E.M. Rogers with F.F. Shoemaker, Communication of Innovations. A Cross-Cultural Approach (New York: The Free Press, 1971), p. 228.

It is apparent programs involving outside change agents for diffusion of appropriate health technologies must be carefully designed utilizing the correct selection of communication channels to offset the disparities between the cultural systems.

The microplan approach, described by King and Martodipoero[27], is a systematic method for the introduction of appropriate health technologies. A microplan, prepared nationally for management of a particular health subsystem need, combines an integrated set of components including technologies, instructional manuals, teaching aids, drug/equipment lists and evaluation instruments. Microplanning is well suited to the comparative simple technology required for basic health services at the primary care level. The entire peripheral health services would be too large for a single microplan. The optimum size of a subsystem for microplanning would be for instance the field of childcare. The appropriate technologies in this field are linked together into a system, and described in a worker's manual which can be used for initial training and re-training. This is in turn backed up with a manager's and teacher's guide emphasizing the components necessary for these roles.

The worker's manual is designed for all workers delivering primary care such as auxiliary and paramedical personnel. The chosen technologies in the microplan are described with enough theory to make sense of the required actions. As this will likely be the only reference book available for the worker, every effort should be made to synthesize the knowledge and practice into a logical system. As King and Martodipoero have stated:

> This system has to be easily understood, problem oriented, completely detailed, well illustrated, extensively cross referenced, thoroughly indexed, and pleasant to read. If it is to be understood and used by junior workers, particularly those not used to English, its language must be the simplest possible, both in lexis and syntax. At the same time it must not offend the more sophisticated reader. The linguistic perfection of the text is thus of great importance. Since the care of the sick is more than mere technology, its style if possible should convey compassion.[28]

The criteria appear exacting, but if a microplan is to succeed, the working manual is an essential component for every worker. Consideration should also be given to preparing training manuals in the local language of the country. Even in so called English speaking countries, the majority of people at the village level only speak their tribal language.

The manager's and teacher's guide contains elements related to the managerial and teaching roles. The purpose is to assist the manager to measure quality of care relative to specified guidelines in the worker's manual, and advice on establishing implementation programs. Quick practical measurement instruments include multiple choice questions and checklists to measure worker's knowledge and understanding, and a simple survey method to determine service coverage. The teacher component in the manual includes guidance on running workshops for introduction of the microplan and its related technologies with emphasis on a practical approach and minimum of theory. The manual includes instruction for simulation exercises and a skills laboratory in terms of a competence based educational process.

The microplan itself comprises a number of components other than the chosen technologies. An important component consists of a drug and equipment list needed for the chosen technologies, and this can be conveniently included in the worker's manual. Other essential components are a set of teaching aids relevant to all aspects of the microplan, and a recording and reporting system. The components integrated together strengthen the total approach of the microplan.

Microplans are particularly suitable for primary health care where health subsystems for concentration can be identified, and effective actions to be taken require little theoretical knowledge. Where possible the equipment required should be constructed at the local level. The transfer of a master microplan on a particular problem to a number of countries could be accompanied by a project regarding local manufacture of the required technology. The merit of microplans is the possibility of wide transfer to countries with similar socioeconomic conditions. King and Martodipoero have noted that the entire technology of the district hospital level down to the peripheral level could be contained in ten master microplans.[29] The advantages of the system's approach in a microplan is the linkage of educational programs to service needs.

At the community level the transfer of appropriate health technology, perhaps within a microplan, will be carried out by the primary health care worker who will provide the first level of contact with the health care system. This worker should not be trained or asked to work in isolation. Performance must be carefully monitored and support and guidance are essential from higher levels of the health care system.

In general, the following principles apply for the selection and training of the primary health care worker:

a) The individual preferably should be selected from the local community.

b) Training should be of short duration and prepare the worker to carry out activities geared to the expressed needs of the community.

c) Training and periodic refresher training should be based on a clear definition of problems, solutions and equipment and methods to be employed.

d) Training should take place in the vicinity of the communities to be served. This will ensure acceptance of the program and the worker by the local community.

e) Length of training will be determined by the aims of the program and the level of literacy of the participants.

f) Inclusion in the program of traditional healers/midwives should always be considered, because of their influence on local health practices and their social standing in the community.

g) The primary health worker should not be overloaded with responsibilities. When necessary, duties should be shared by two or more workers.[30]

It is suggested that remuneration for the primary health worker should come from the local village council, either in cash or in kind. This would represent a sense of commitment and support by the village in health related activities. By a process of self help, the community would be contributing resources in pursuit of chosen health objectives. This would also encourage a greater sense of belonging to the community on the part of the primary health worker.

Learning and resource material used in training should be relevant to local requirements, and readily understood by the primary health care trainee. The importance of communication techniques should be emphasized in training and include group dynamics, simulation methods and dialogue techniques utilizing the oral medium of song, dance and story telling.[31]

Stage 4 - Transfer Process -
Preparation of the People in the Community for the Technology

The primary health worker will serve as the change agent in the transfer process of appropriate health technology at the community level. The worker should preferably be from the local community, and would therefore be familiar with traditional beliefs and attitudes relating particularly to health and disease. This local knowledge would give the worker a unique advantage in the diffusion of the technologies required in the particular health strategy.

However, as Garforth[32] has pointed out, the transmission of technical information is not sufficient in itself to bring about changes in attitudes and behavior. Increasing the motivation of rural people towards change is equally, if not, more important. Although the technology may be appropriate based on sound socioeconomic research of the local situation and population, it can still be rejected. A way of developing motivation is to encourage active participation of the people themselves in the planned health program. Participation which occurs even earlier in the planning phase can be a determinant of success in programs. Garforth has reported on a pilot project in Tanzania in development of appropriate grain storage technologies. The local villagers, through a village dialogue methodology, were involved from the beginning in the research and design of the project. This resulted not only in appropriate recommendations, but also in a favorable response to the design choice.[33]

Participation of the local community in health "soundings" as outlined in stage 1, would serve to stimulate motivation throughout involvement in problem definition. As Rogers has observed, the selection of appropriate communication channels is of paramount importance in the diffusion of innovations.[34] This is necessary to ensure that the context of the message will affect a given set of receivers. Communication channels can be categorized as mass media or interpersonal in nature. Mass media channels reach a large audience rapidly, can develop knowledge, can spread information and can bring about changes in attitudes. Interpersonal channels involve face to face or two way exchange of ideas, hopefully resulting in greater clarification regarding the innovation. Interpersonal channels can persuade individuals to change attitudes. It is apparent that the most effective way to reach people with new ideas and innovations, is to use a combination of mass media and interpersonal channels.

Media forums, representing a combination of both mass media and interpersonal channels, have been used to advantage in the diffusion of new ideas in developing countries. Media forums consist of organized small groups of people who meet regularly to receive a mass media program, such as radio, tape, slides, etc. and then discuss the content of the program. Media forums exert social pressure on attendance and participation, which in turn affects attitude change.[35] Garforth has also drawn attention to the justification for using a group focus in communication in rural extension strategies.[36] Group methods offer greater coverage, are cost effective, and produce mutual reinforcement of new practices and a focus for joint action.

Indigenous performing arts such as theatre, puppets, dance and song can be useful mediums for preparing the community for health technology transfer. The effectiveness of the performing arts as a tool has been explained in terms of its entertainment value; its basis in an oral medium and local languages; and its dramatic representation of local problems for analysis and problem solving by community participation[37]. The W.H.O. working guide for the primary health worker outlines a range of methods for teaching purposes including group methods, story telling, play acting, dance and visual aids such as posters and pictures.[38] The Freire approach to "consciousness raising" emphasizes group dynamics and dialogue techniques to stimulate discussion, analysis and action.[39] These various approaches would appear to cover the elements of knowledge, persuasion, decision, and confirmation necessary for adoption of an innovation as outlined by Rogers in his model of the innovation-decision process.[40]

It is clear that the straight forward communication of technology information is not tenable in the context of developing countries. Methods for appropriate health technology transfer must incorporate a capacity for meaningful two way communication between health personnel and the community to ensure participation and acceptance.

Stage Five - Implementation

An important factor prior to any implemention phase is to consider the consequences of introduction of the appropriate health technology or microplan on the social system. Researchers and change agents in the past have given little attention to consequences, assuming that introduction of an innovation will only produce beneficial results. Rogers has noted that few studies on the consequences of innovations have been reported in the literature.[41] Furthermore, the study of consequences in complicated by the fact that they occur over a period of time. It is important however, that the change agent takes responsibility for introduction of an innovation in terms of predicting the advantages and disadvantages prior to implementation. Introduction of appropriate technology as a form of planned, social change can produce social and economic reactions that will permeate the social system.

Before widespread implementation, the appropriate health technology or microplan should be introduced on a pilot basis in a carefully conducted field experiment. In this way, sound quantifiable data about consequences over time can be obtained, and the results evaluated under realistic conditions prior to widespread implementation. A pilot program on an experimental basis would utilize information noted in Stage One on conditions in the receiving social system, followed by the field trial introduced on a small scale. Such as experimental project would reveal the major errors that could be encountered prior to widespread implementation. As Rogers has observed:

> This approach can prove far less costly than the blind introduction of an innovation on a massive scale, based on the vague hope by the change agent that he has correctly guessed the nature of the innovation's consequences.[42]

An important aspect to be taken into account is that short range and long range consequences may be different and often contradictory. The question of ethics must be addressed if the people involved must tolerate undesirable short term consequences to accomplish desirable long term consequences. The ideal rate of change needs to be established for appropriate health technology transfer in the implementation stage. The technology should be introduced at such a rate to ensure the social system can balance and adjust the changes.

Stage Six - Evaluation of Results

To ensure that the appropriate health technology program is meeting its objectives, an evaluation process must be built into the program. Evaluation should encompass a review of the program in terms of its relevance, progress, efficiency, effectiveness and impact. Evaluation is an essential element in assessing the management, planning, training and implementation of an appropriate health technology program. A WHO technological report noted:

> Evaluation is a continuous process aimed mainly at correcting and improving actions and thereby increasing the relevance of health and training programs to the social and health needs of a country's population. It is a systematic way of learning from experience, and should not be regarded merely as a sterotyped procedure.[43]

In planning a training program for front-line personnel engaged in the transfer process of appropriate health technology, provision should be made for evaluation of all components of the training program. This will be assured by ensuring assigned responsibilities are clearly defined, performance objectives are stated and understood, and standard performance indicators are utilized. The teaching/learning process is a component of the program which requires constant monitoring regarding effectiveness, efficiency and impact. Particular indicators could, for example, include measures of competency acquired, target population served, type of services delivered, and degree of accessibility to care. The evaluation of educational programs can be seen in light of a broader process to improve health care, and this also covers continuing education programs for health personnel.

As indicated in Stage Five on Implementation, importance must be attached to studying consequences following the introduction of appropriate health technology. The study of an innovation's consequences cannot be assessed by simply adding additional questions to a survey instrument. An operations research approach should be employed so consequences can be analyzed as they unfold over time and modifications made. Rogers has drawn attention to the value of a panel study which consists of a double survey, in that respondents are interviewed more than once.[44] Respondents are interviewed both before and after introduction of the innovation to obtain the desired information about consequences. Sound data about consequences can also come from field experiments introduced on a pilot basis.

Judgements regarding consequences tend to be subjective and value laden, irrespective of who makes them. Cultural norms, preferences and bias enter into the frame of reference for every observer of the social scene, despite efforts to remove these prejudicial attitudes. In evaluating results of the appropriate health technology, the observer will be influenced by his cultural and educational background and his personal experiences. According to Rogers, cultural relativism must be taken into account when evaluating data about the consequences of an innovation.[45] The concept of cultural relativism considers that each culture should be judged according to its own particular needs and circumstances. Each culture has a set of norms, beliefs, values and attitudes developed over time which suits its particular situation.

Therefore, data reflecting the introduction of an innovation collected from the community, change agents or scientific observers will tend to be subjectively influenced by their respective cultural beliefs. Consequences should be judged on results relative to the community's culture, and not be shaped by an outside view of the needs of the community.

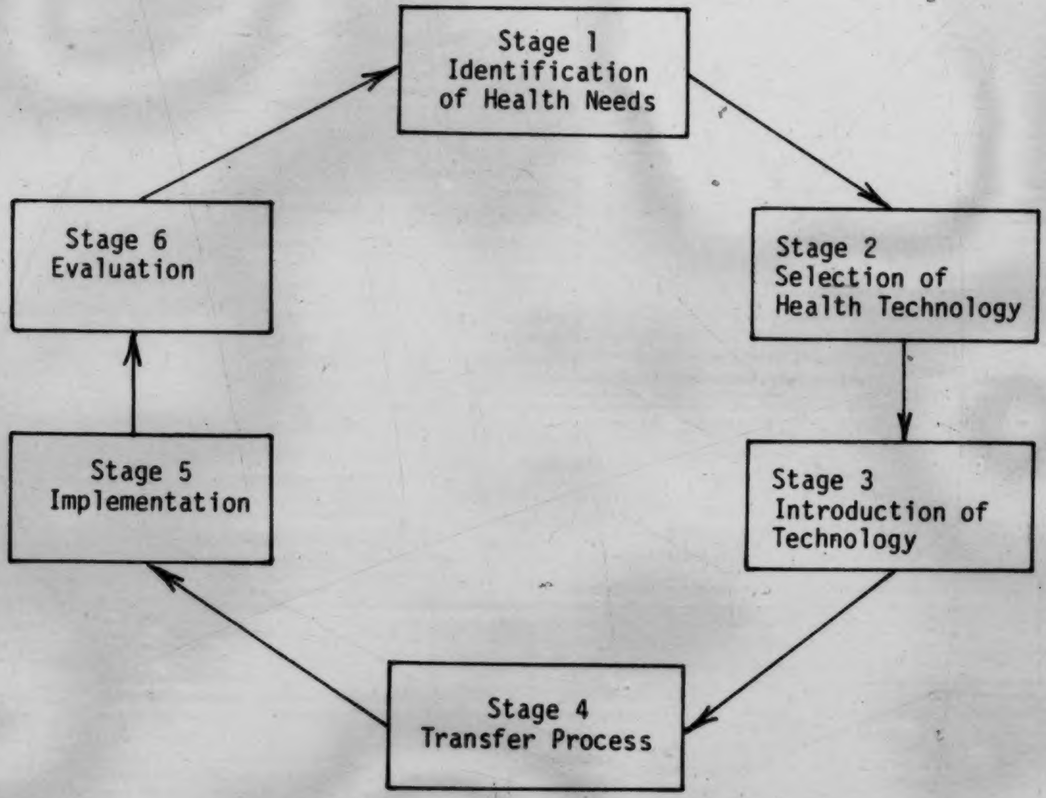
Evaluation requires sound judgement based on relevant and reliable information obtained by the utilization of both indicators and criteria. Data to measure change directly or indirectly, must be selected carefully to ensure that they are adequate for the subsequent data analysis. Criteria concern the standards against which changes can be measured, and these may be social, technical or administrative in nature. For example, basic criteria necessary for evaluation in primary health care should include the following:

- availability of safe drinking water in the home or within 15 minutes' walking distance;
- adequate sanitary facilities in the home or immediate vicinity;
- adequate coverage by immunization against diphtheria, tetanus, whooping cough, measles, poliomyelitis, and tuberculosis;
- availability of local health care including at least 20 essential drugs, within one hour's walk or travel.
- availability of trained personnel for attending pregnancy and childbirth, and caring for children up to at least 1 year of age.[46] Finally, evaluation should provide valid and reliable grounds on which to revise and adapt the total program with

reshaping of objectives as necessary.

The author has presented a community development model for appropriate health technology transfer in developing countries. The model consists of six sequential stages in the process as shown in figure 11.

Figure 11
A Community Development Model for Appropriate Health Technology Transfer


Stage 1
Identification of Health Needs
Stage 2
Selection of Health Technology
Stage 3
Introduction of Technology
Stage 4
Transfer Process
Stage 5
Implementation
Stage 6
Evaluation

Within the main stages of the model, a number of specific strategies and techniques have been proposed as a means of arriving at problem formulation, technology selection and transfer. An assumption of the model is that it will take place within a primary health care framework, which will provide the intersectoral coordination in the health care system to implement the strategies outlined.

The model encompasses a community development perspective, in that it involves the community in active participation in all stages of the process of appropriate health technology transfer. The assumption is that people have the capacity to perceive and judge their living circumstances, and to adopt behaviors to improve these circumstances. The model also implies collective action to achieve objectives by marshalling the energies and resources within the community. The development of the community is achieved through action towards those objectives. Where the problem encountered is one which extends beyond local limits, effective action at the community level can influence other levels in the wider political and social system of the country. The learning and acquisition of knowledge, skills and attitudes on the part of the community through the educational process can be carried over into participation in the wider context on the national level.

Footnotes

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17 *Ibid*., p. 40.

18 *Ibid*., p. 41.

19 *Ibid*., p. 42.

20 *Ibid*., p. 47.

21 A. Parker, "Health Technology and Primary Health Care," Social Science and Medicine, XII, (1978), 36-38.

22 *Ibid*., p. 37.

23 *Ibid*., p. 34.

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26 *Ibid*., p. 248.

27 M.H. King and S. Martodipoero, "Health Microplanning in the Developing Countries: A Systems Approach to Appropriate Technology," International Journal of Health Services, VIII, No 4 (1978), 653-664.

28 *Ibid*., p. 657.

29 *Ibid*., p. 661.

30 WHO, *The Primary Health Worker*. Working Guide (Revised ed.; Geneva: World Health Organization, 1980), p. 3-5.

31 *Ibid*., p. 305-309.

32 C. Garforth, "Reaching the Rural Poor: A Review of Extension Strategies and Methods" in *Progress in Rural Extension and Community Development*, Vol I, ed. by G.E. Jones and M.J. Rolls (Chichester: John Wiley & Sons Ltd, 1982), p. 59.

33 *Ibid*., p. 59.

34 E.M. Rogers with F.F. Shoemaker, op. cit., p. 253.

35 *Ibid*., p. 266.

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38 WHO, *The Primary Health Worker*, op. cit., p. 296-297.

39 P. Freire, *Pedagogy of the Oppressed* (New York: The Seabury Press, 1970).

40 E.M. Rogers with F.F. Shoemaker, op. cit., p. 103.

41 *Ibid*., p. 319.

42 *Ibid*., p. 338.

43 WHO, *Training and Utilization of Auxiliary Personnel for Rural Health Teams in Developing Countries*. Technical Report Series 633. (Geneva: World Health Organization, 1979), p. 25.

44 E.M. Rogers, with F.F. Shoemaker, op. cit., p. 325.

45 *Ibid*., p. 326.

46 WHO, *Global Strategy for Health for All by the Year 2000* (Geneva: World Health Organization, 1981), p. 76.

WHO, *Development of Indicators for Monitoring Progress Towards Health for All by the Year 2000* (Geneva: World Health Organization, 1981), p. 40.

CHAPTER VI

CONCLUSION

The role of community development in appropriate health technology transfer to Third World countries has been the focus of this study. In order to arrive at a community development framework, the study has examined the concepts of appropriate technology, technology transfer and primary health care in relation to the health needs of developing countries.

The magnitude of health problems in developing countries, compounded as they are by widespread poverty, ignorance and lack of resources, are daunting. Experience has shown that conventional health services, modelled on Western approaches, are inadequate and inappropriate to meet the basic health needs of the population. Some of the most serious deficiencies in providing health care have stemmed from using health care systems that do not match the needs or the resources available, and in training health personnel in ways which have little relevance to the work to be done.

Health services have many forms, but to be effective they must have a distribution which puts essential services within reach of the people who need them. It is apparent that an alternative approach is required, which calls for a new type of personnel, a new technology, a new system and a new philosophy. The primary health care concept is currently regarded as the most practical and rapid solution to the health situation existing in developing countries. Primary health care addresses the main health problems in the community providing promotive, preventive, curative and rehabilitative services. It is an integrated approach to health that also spans food production, education, water and sanitation; in addition it emphasized self reliance and partnership between communities and governments. Although the concept has achieved widespread intergovernmental support as a result of the 1978 International Conference on Primary Health Care, in many developing countries the rhetoric still needs to be translated into effective action.

The most single important factor in promoting primary health care is a strong political will and support at both the national and community level, reinforced by a clearly enunciated national health policy. Primary health care is likely to be most effective if it employs means that are understood and accepted by the community, and applied by primary health workers at a cost the community and country can afford. These primary health workers including traditional practitioners, where applicable, will function best if they reside in the community they serve, and are properly trained to respond to the community's expressed health needs.

Successful primary health care requires the development and application of an appropriate health technology. Technology must be geared so the solution is appropriate in the sense that it is scientifically sound and acceptable to those who will apply it, and to those for whom it is used. This implies that technology should be in keeping with the local culture. It is an advantage if the equipment selected can be manufacturered locally at low cost. Maintenance of equipment should preferably be within the capacity of local people and local facilities. Where possible, indigenous materials should be used for small scale manufacture of equipment within the country. If it is necessary to import materials, these should be easily available and of the lowest possible cost. Information is required to define the kind of technology which should be developed and used. This calls not only for technological research, but also for knowledge of the relevance and value of various procedures under different ecological and social conditions.

Technology transfer from industrialized to developing countries is not a neutral process, because it is often permeated by the cultural values of the donor nation. A situation of technological dependency can occur through the asymmetry of technological knowledge, skill and control between the donor and recipient country. There is need therefore to assess and choose in the transfer process from a range of alternative modern technologies, to scale technology to local needs and to foster innovation in the extension of traditional technologies.

In order to make primary health care universally acceptable in the community, maximum community participation in health development becomes essential. A community can participate in every stage of primary health care. It can participate in the assessment and definition of health problems, the establishment of priorities, and in the development and carrying out of programs. Furthermore, a continuing dialogue between health personnel and the community is necessary to ensure that the community's views and aspirations are fully understood.

A community, for the purpose of organizing a primary health care program requiring strong community involvement, can therefore be described as a group of people with a sense of belonging to the same entity, has a common perception of collective needs and priorities, and can assume collective responsibility for community decisions. This, in essence, relates to the concept of community development. Inherent in community development is the encouragement of cooperation, self reliance and self determination among people in the community.

Community development can be viewed as the local counterpart of national development. Community development therefore can be considered a bridge to influence the course of developmental change at the community level. This is achieved by means of organized efforts to enhance the conditions of community life and the capacity for community integration and self direction. Features of these efforts include a planned program, encouragement of self help, technical assistance and integration of different specialities to assist in the community. In the realm of technical assistance, community development can assist in the diffusion of new ideas, such as the introduction of new health practices, by the provision of personnel, techniques and supplies. Community development can be seen as a means to guide and achieve change at the community level, ideally in keeping with the local values and beliefs.

The primary health care model relates to Rothman's models A and B of community development. Model A - locality development, encourages people in the community to participate in determining community goals and actions which bring about change in the community. Model B - social planning, recognizes the role of government in the central planning for the proper allocation of resources and technologies and linkage to other levels in the health care system. The model B approach presupposes that major environment change requires expert planners, who can skilfully guide complex change processes.

In this study, the author has proposed a community development model for appropriate health technology transfer in developing countries. This model consists of six sequential stages. Imbedded within the main stages of the model, specific strategies have been outlined for health problem definition, technology selection and transfer. The model presupposes that appropriate health technology transfer will take place within a primary health care framework to ensure the necessary coordination and linkages required in the health care system. The community development process can make an important contribution to health care in developing countries. By direct involvement in the community's health care system, emphasis can be directed to the development of social skills, attitudes of self reliance, self determination and cooperation. Community participation of this nature provides a new resource in terms of people who will contribute their efforts to strengthen health services. This is of crucial importance, if health services are to be understood, accepted and compatible with community wishes.

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